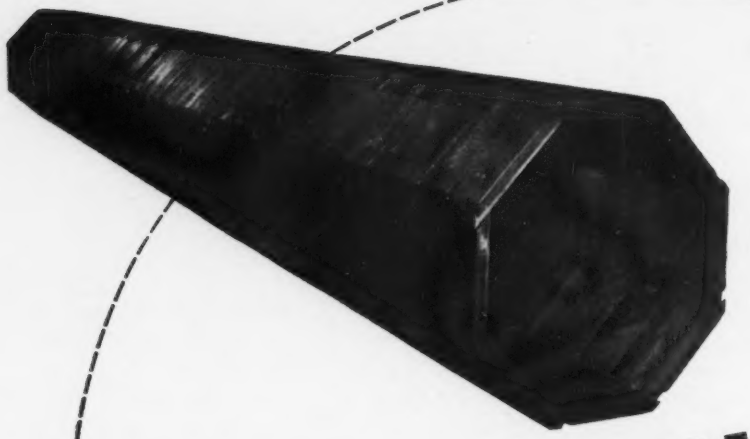
ENGINEERING NEWS-RECORD

AUGUST 26, 1943

Seabees Take Over Londonderry Naval Base

Pittsburgh Remodels Its Liberty Tunnels

Concrete Rigid Frames For Industrial Plant



WOOD PIPE CARRIES ON

while steel saves lives

More and better equipment on the fighting front means a shorter war and fewer American lives lost. You can help by saving vital metal wherever possible.

One way is to substitute ARMCO Emergency Wood Pipe for drainage structures made of critical materials. This sturdy pipe requires no steel sheets and bands, wire mesh or metal reinforcing. It is easy to handle, saves on transportation and has ample strength to meet engineering standards. When the emergency is over, a corrugated metal pipe may easily be threaded through or jacked around the wood structure.

ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back after the war with its flexible strength, long lengths, tight joints, and low installation costs.

Meanwhile, steel must not be used in any drainage structure unless engineering integrity demands it. Remember it's not just pounds of metal you are saving—it represents ships, trucks and tanks delivered to our fighting fronts. As desirable as ARMCO Ingot Iron culverts are, you'll find ARMCO Emergency Pipe a practical substitute. Write for data. Armco Drainage Products Assn., 135 Curtis St., Middletown, O.

ARMCO ARMCO **EMERGENCY PIPE**

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Shipbuilding, Irrigation, Canals, Railroads

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Vol. 131 AUGUST 26, 1943 No. 9

COMING NEXT

• How the world's largest maritime training center was built, which included accommodations for 16,000 men and will be described in *ENR* for Sept. 9. The project was essentially completed within 120 days. In addition to its size and speed of construction, the project is notable for the complexity of the various design elements and the ingenuity with which the architect-engineers and the contractors worked out the problem of structural form and economy in use of critical materials.

• To save time in designing complicated doubly reinforced concrete beams, J. F. T. Pate, New York structural engineer, has developed a new set of formulas (*ENR* Sept. 9) to permit tables of concrete sections to be prepared by the same principles as structural steel tables. With the present widespread substitution of reinforced concrete for steel, these formulas should be of unusual value to design engineers.

• Unreinforced concrete septic tanks for small housing projects have been successfully used in Arizona. The tanks were designed as an arch in sections so all stresses are compressive and reinforcing steel eliminated. To simplify formwork, end sections were designed as arches with the same radii as the barrel sections. These tanks will be described in *ENR* for Sept. 9.

LOOKING AHEAD

• Recent comprehensive loading tests made on timber connectors whose axes are neither parallel nor perpendicular to the grain of the connected timbers provide data that will now enable engineers to calculate accurately the proper spacing of connectors. In an early issue of *ENR* these tests will be described and a procedure for determining the proper spacing will be recommended. This information should clarify a number of questions often raised by designers. If the charts and tables accompanying this article are used it will undoubtedly result in more economical designs, which also can be made faster and easier.

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CHANGE OF ADDRESS

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Director of Circulation:
Please change my address on Engineering News-Record

From .....

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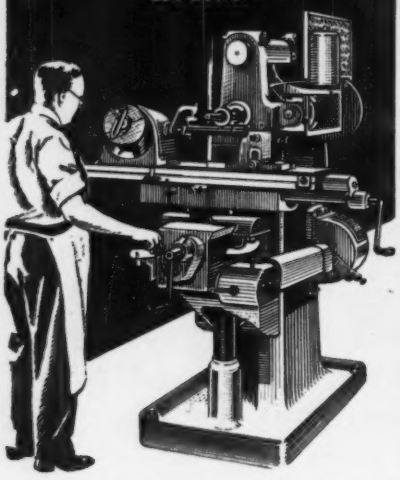
LIGHT FROM FLOORS

helps war workers see better



TO INCREASE the effectiveness of the lighting facilities, plants built for Boeing, Consolidated, Douglas and North American have light-colored concrete floors made with *white* portland cement instead of with *gray* portland cement or other darker materials.

Tests in Consolidated's plant at Fort Worth show that the white-cement floor compared with a gray-cement floor in the same plant reflects 61% more light to underside of wings and provides 20% more light on vertical faces of work.

Because it salvages waste light, a light-reflecting concrete floor made with Atlas White cement—

- ***decreases shadows and dark areas;***
- ***makes seeing easier and quicker;***
- ***reduces eyestrain, headaches and absenteeism;***
- ***reduces accidents, errors, spoilage and shutdowns;***
- ***increases quantity and quality of production.***

Maintenance is simple—frequent sweeping, occasional damp mopping, periodic scrubbing.

Write for new book, "Light From Floors." It gives detailed information on the value, installation and maintenance of light-reflecting concrete floors made with Atlas White portland cement. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

ENR-F-22

ATLAS
WHITE CEMENT
For Light-Reflecting Floors

PENNSYLVANIA INSTALLS NEW SAFETY CURB

Increases driving safety on important roadways with White Concrete Reflecting Curb

White Concrete Reflecting Curb, Essington Ave., Philadelphia, Pa. *General Contractor, Union Paving Company, Philadelphia: Curb Contractor, Frapaul Construction Co., Inc., Hackensack, N. J.*

PENNSYLVANIA'S DEPARTMENT OF HIGHWAYS has installed White Concrete Reflecting Curb on Route 263 between Philadelphia and Willow Grove—and on the new access roads leading to Philadelphia's Airport and Navy Yard.

This safety curb increases driving safety because it greatly increases visibility of the road's edge—in the daytime, at night, and most of all on rainy nights. The diagram below shows how and why it is such an efficient safeguard.

White Concrete Reflecting Curb, made with Atlas White cement, is successfully helping to cut down traffic accidents in many locations in a number of states. On rainy nights, when visibility normally is lowest, this new type curb is particularly effective. The film of water on the scientifically-designed reflecting surfaces intensifies the reflection of light back to the driver's eyes.

The complete story of White Concrete Reflecting Curb is contained in a new book, "A White Guide to Safety." Send today to Universal Atlas Cement Company, (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, New York.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

ENR-H-38

When headlights strike smooth curb, the light is wasted—it is reflected forward, away from the driver—visibility is low or nil. But when headlights strike Reflecting Curb, its saw-toothed faces reflect the light directly back to the driver's eyes. Result: a gleaming white guide to safety.

ATLAS WHITE CEMENT
for white concrete reflecting curb

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • AUGUST 26, 1943 • VOLUME 131 • NUMBER 9

No emergency action required to meet Chicago water needs

Federal investigators find that the city can check threatened pollution of its water supply within the limits on lake diversion set by the U. S. Supreme Court

Exercise of emergency wartime powers to permit Chicago to increase its diversions from Lake Michigan is neither necessary nor desirable, according to a report submitted to President Roosevelt on Aug. 6 by Donald M. Nelson, chairman of the War Production Board and Leland Olds, chairman of the Federal Power Commission. Mayor Kelly of Chicago had asked the President to exercise his emergency powers on the grounds that increased diversion through the Calumet-Sag Channel was necessary in order to keep pollution from reaching water intakes in Lake Michigan in quantities to endanger the health of citizen of the city's South Side (*ENR* July 22, p. 169).

Courses open to the city

After a detailed study of the problem, Messrs. Nelson and Olds state: "We have come to the conclusion that exercise of emergency wartime powers in this instance is not necessary or desirable" for the following reasons:

1. Construction of additional water treatment facilities for Chicago is provided for by priorities already granted by the War Production Board. These facilities, which should be completed by 1944, are calculated to give ample protection to the city for the duration of the war.

2. Pending completion of these additional facilities, there is every reason for confidence that Chicago's present chlorination facilities, which have been strengthened since last summer, will be adequate for the critical period this year, assuming that efficient operation is maintained. Existing facilities coped successfully with heavy pollution during the last two summers. Pollution so far this year, as reflected in Chicago's records, has been less serious than for a number of years, including the past two years.

3. If additional diversions become necessary to counteract pollution, they will only be needed in limited amounts and for short periods until the presently authorized works are in operation. The city of Chicago can now make such additional diversions, relying on reductions later to keep within the annual limitation.

4. The Supreme Court, which fixed the annual limit, retains jurisdiction to modify the decree governing diversion of Lake Michigan water by the Chicago Sanitary District. If the limited additional diversions which may become necessary should leave an insufficient balance of diversion for the remainder of the year, the city's application for an additional amount should be addressed to the court.

Pollution not serious

With respect to statements by representatives of Chicago that the bacterial content of water for the south district is higher than the limit suggested in the U. S. Public Health Service Manual for production of safe water by chlorination, the report states that War Production Board sanitary engineers (including Abel Wolman, who participated in preparation of the manual) point out that the manual relates only to simple chlorination, whereas in Chicago's south district double and super-chlorination are employed. "Under these conditions, the bacterial content of the water supply does not seem to justify apprehension."

The report states that in 1942 the WPB issued priorities for work on tunnels that must be completed before the South Side purification plant can be put into use. Those tunnels will be completed in 1944. This past March the WPB granted priorities on materials required for the coagulation and sedimentation structures at the plant and on equipment for those structures. This will permit them to be put into service next summer, "provided the city acts with diligence in carrying out the project." These facilities, the sanitary engineers believe, "will adequately safeguard the public health of Chicago for the duration. The filtering facilitites . . . are not essential for maintaining adequate standards of safety during the war."

Temporary increases in diversion

Under the Supreme Court order limiting diversion from Lake Michigan to an annual rate of 1,500 cfs., the report points out that Chicago can increase the diversion in an emergency to prevent reversal of flow in the Calumet River that would bring pollution into Lake Michigan, provided diversion is reduced sufficiently at other times to keep within the total limit. This has been done in the past.

In view of this and the fact that the city can always apply to the Supreme Court for relief in an emergency, the report holds that a general lifting of the limit on diversion is not necessary. Such action, it states "might be considered as a precedent, affecting rights which have been the subject of litigation over a period of many years".

This report by Donald Nelson and Leland Olds was sent to Mayor Kelly by President Roosevelt on Aug. 9 with a statement that he felt that the Supreme Court would act promptly should emergency diversions become necessary.

Engineer officers to be retired Sept. 1

An undetermined number of officers of the Corps of Engineers are among a total of 900 in the armed forces past the retirement age whom the War Department proposes either to relieve of active service or retire, beginning the first of September, unless they are shown to have special qualifications.

There are 30 such officers directly under the jurisdiction of the Chief of Engineers, and many others under the various service commands. They include major generals and higher ranking officers past 64 years of age, brigadier generals over 62 years, and all other commissioned officers over 60.

Due to a shortage of senior officers at the beginning of the military expansion program, a large number past the retirement age were continued or placed on active duty. Now younger officers are said to be available, and the War Department deems it to the best interest of the service to replace the older men with younger ones.

The number retired will depend on the value of each officer to his position, and the readiness with which he can be replaced. It is not expected that the Corps of Engineers will know until late September how many replacements it will have.

Postwar plans begin to take shape in water supply and sewerage field

Four associations plan to work through state committees in stimulating action on needed facilities. Federal aid for city work opposed.

More details of the program of the Committee on Water and Sewage Works Development were made public last week. The committee, which was set up as a joint undertaking of the New England Water Works Association, Federation of Sewage Works Associations, American Water Works Association and the Water & Sewage Works Manufacturers Association, is headed by Abel Wolman, professor of sanitary engineering at Johns Hopkins University. E. L. Filby of the Black & Veatch organization in Kansas City is field director and Harry Jordan, secretary of the American Water Works Association, is secretary. Other members of the committee are C. H. Becker, manager, hydrant and valve department, R. D. Wood Co., Philadelphia; E. S. Chase, consulting engineer, Metcalf & Eddy, Boston; C. A. Emerson, consulting engineer, Havens & Emerson, New York; and R. W. Esty, superintendent of the water department, Danvers, Mass.

The committee plans to work through state committees to promote the following activities.

1. An appraisal of the needs for water and sewage works improvement or construction.
2. The development of orderly programs for meeting these needs in the order related to their value to the city or the region.
3. The preparation of detailed plans and specifications for the needs of first importance as soon as arrangement can be made.
4. Consideration of, and development of methods for funding the necessary construction.
5. Reappraisal of authority under which the contemplated projects can be carried on as well as the legal basis for funding such operations. (Promotion of legislation whenever needed.)
6. Definite scheduling of the construction program. (Immediate purchase of land and rights-of-way if part of the projects.)

Expenditure of $300,000,000 a year for the next two decades is estimated by the committee as necessary to meet reasonable needs for water supply and sewerage.

Federal aid opposed

"We do not believe that we have to wait for federal aid either for the planning or for the execution of useful public works. We perceive no substantial evidence that American cities need federal aid to put their water-works and sewerage programs into action, but rather that the weight of evidence is to the contrary. Both municipal construction and maintenance have deliberately been substantially deferred during the war period while national income has grown to heights never before attained. Thus we can but feel that waiting for federal aid can only breed the necessity of having it, while forthright local progress in planning as well as execution of public works, under the conditions and with the freedom in which American cities for generations carried on such work, will restore the true responsibility that every city and region has for putting its affairs in order and its public-works program into effect."

WASHINGTON HIGHLIGHTS

Though the question is not yet definitely decided as to who will own the proposed 230-kw. transmission line from Shasta Dam to Oroville in California (*ENR*, Aug. 5, p. 230) the Bureau of Reclamation took bids Aug. 16. The R. A. Wattson Co., Los Angeles, with a bid of $207,531 was low bidder for the 98-mile line. The Pacific Gas & Electric Co., with which the bureau has been negotiating for the purchase of the power from Shasta Dam, prefers to own the line itself. A bill expected to be introduced in Congress would in effect determine whether or not it comes within the jurisdiction of the bureau to construct and operate high tension lines.

Setting forth that there is nothing in either the Federal Power Act or in judicial interpretation of the commerce clause of the Constitution that requires a showing of the employment of vessels or watercraft in order to term a stream navigable, the Federal Power Commission has held the Michigamme and Menominee rivers in Wisconsin and Michigan to be navigable because of their use for the floating of logs to mills. It ordered, therefore, that the Wisconsin Michigan Power Co., Appleton, Wis., amend its application for a federal license to include its Twin Falls hydro-electric development on the Menominee River, as part of the complete project which includes the Way Dam and reservoir and Peavy Falls Dam and power plant on the Michigamme River, for which it has already made application for license.

On Aug. 18, President Roosevelt ordered a triple set of restraints on employers, unions and individuals who refuse to comply with WLB orders.

For employers, the punishment is that the government will withhold priorities for materials, hold up war contracts and seize and operate the industry or project. Non-complying unions will be denied check-off and other benefits. Dues collected from the check-off will be held in escrow for the benefit of the union and to be delivered to it upon compliance. For non-complying individuals, the punishment is modification or cancellation of draft deferment or employment privileges, or both. The order establishes a uniform procedure in dealing with defiance cases, thus doing away with the necessity of referring each separate case to the White House.

It is estimated that it would now cost approximately $2,000,000 to replace the Army Corps of Engineers' hopper dredge, *Galveston*, which was sunk off the gulf coast near Galveston, Tex., with a loss of life of ten crew members, including that of the dredge master. The dredge, built in 1908 at a cost of $390,000, was a total loss after it had dragged its anchor and rammed a breakwater in the hurricane that recently swept the area.

Maximum prices for all standard grades of Southern hardwood board lumber have increased $6 per 1,000 board-feet, effective Aug. 21. The increase affects over 90 percent of the Southern hardwood production, and is the first general increase for this stock since ceilings were established in February, 1942.

The new prices do not apply to construction boards, white oak and red oak structural stock or sound square edge material, common dimension, or to items priced under special regulations.

The services of sewerage system operators were among a number of activities recently added by the War Manpower Commission to its list of essential activities. WMC recommends that irreplaceable persons engaged in key positions in the activities listed be given draft deferment preference. However, the list is only intended as a guide to draft boards, and its use is not mandatory.

The War Production Board in settling a jurisdictional dispute held that a contract between the Fruin-Colnon Co. and the Granite City Steel Co. of Granite City, Ill., left the contractor free to hire anybody he chose to install the machinery in a new plant.

The International Association of Machinists, which has a contract with the Granite City Co., objected to the hiring of AFL carpenters by the construction company to install the machinery, claiming machinists had always performed such work. Fearing a strike, the company ordered a halt in installation, but was ordered by WPB to rescind its halting order.

New construction declines steadily as emphasis shifts in war program

The downward trend is likely to continue as the transition from plant building to material production is accelerated. Total, however, still high with respect to prewar years.

Total new construction activity in continental United States during the first six months of 1943 is estimated at $4,524,000,000, 24 percent below the same period in 1942 and 40 percent below the second half of 1942, the Department of Commerce has announced.

Although there has been some tendency to level off in recent months, perhaps due to seasonal influences, the decline which began in September, 1942, has developed at a steady pace. By June, 1943, the volume of construction was only $722,000,000 as compared with the August, 1942, peak of $1,486,000,000.

Further sharp declines are anticipated by the department during the remainder of the year, particularly as the transition from production of plant to production of material becomes more pronounced. If, as seems probable, new construction expenditures during the second half of 1943 run between 3.0 and 3.5 billion dollars, the total for 1943 will approach 8 billion. Such a volume would be a marked reduction from the 1942 and 1941 levels but would still exceed construction in most years prior to 1941.

Less war construction

The decline in total construction has been due largely to the falling off of military and naval construction and publicly financed industrial building. Expenditures on these components were $3,097,000,000 in the first half of 1943, a decline of only 6 percent from the corresponding period in 1942, but of 44 percent from the second half of that year.

The significance of the sharp fall in these two components directly related to the war effort is reflected clearly in their relationship to total war expenditures. Together they accounted for about 20 percent of total war expenditures in the first three quarters of 1942, less than 14 percent in the last quarter of that year, 9 percent in the first quarter of 1943, and only 6 percent in the most recent three-month period. Except for completion of work already started and for spot projects that are found to be necessary for some particular phase of the war, the relative importance of these two components may be expected to be further reduced.

Two-thirds of the total

Despite the sharp curtailment of military and naval construction and of publicly financed industrial building, these two components still constituted more than 61 percent of total construction activity in June, 1943. Nonfarm residential building, which has been rising slowly in recent months, made up over 21 percent, and all other types of construction constituted the remainder.

February, 1943, marked the turning point in the clearly defined shift that has occurred during the last three years in the means of financing new construction. The ratio of privately financed construction, which fluctuated in 1939 and 1940 between one-half and two-thirds of the total, dropped below 50 percent for three of the four quarters of 1941, and by the end of the first quarter of 1942 it was less than one-third.

This ratio continued to decrease until February, 1942, when less than 14 percent of all new construction was privately financed. It then began to increase so that by June of this year it exceeded 20 percent of the total of projects then under construction.

Airborne scraper and bulldozer

Revolutionary in the earthmoving field because it can be airborne and even crash-landed for use on wartime fighting fronts, the "D. Tournapull" is now being built for the Army by R. G. LeTourneau, Inc., of Peoria, Ill.

Equipped with a 2-yard carryall scraper and tiltdozer, the D Tournapull has a "flying" weight of only 3¼ tons. Big, pneumatic rubber tires give the unit more than ample flotation on soft surfaces, and enable it to carry heavy loads over concrete roads and runways. It possesses speeds up to 18.8 miles per hour.

Easily convertible, the D Tournapull may be hooked to a flat-bed trailer capable of trucking a 7,000-pound tractor, ammunition, guns or other military supplies, an 800 to 900-gallon fuel tank, or other weight equivalents. A LeTourneau crane, capable of up to 4,000-pound lifts, can replace the trailer. In addition, a powerful rooter tooth is attachable to the scraper to rip through baked earth or similar hard surfaces.

Close-coupled, compact in design, and as ruggedly built as its big brothers, the new Tournapull affords unusually quick, one-man, wartime operation. LeTourneau engineers also envision the D Tournapull operating in peacetime on farms, in factories, for township needs; wherever, in short, there's digging, pushing, pulling or lifting to be done.

Materials now available for 100-octane gas plants

The Construction Section of the Refining Division of the Petroleum Administration for War has been expanded into a separate division. One of its main functions will be to find sufficient labor to keep up with the supply of materials which are now becoming available in more adequate amounts for construction of plants to produce 100-octane aviation gasoline. Max B. Miller, chief of the replaced construction section, has been made director of the new division.

Acting Petroleum Administrator for War Ralph K. Davies, in announcing the change, said:

"To be certain that we will continue to provide our flyers with all the aviation gasoline that they require, we must expand the aviation gasoline refining capacity as rapidly as possible. That is the function of the enlarged new division.

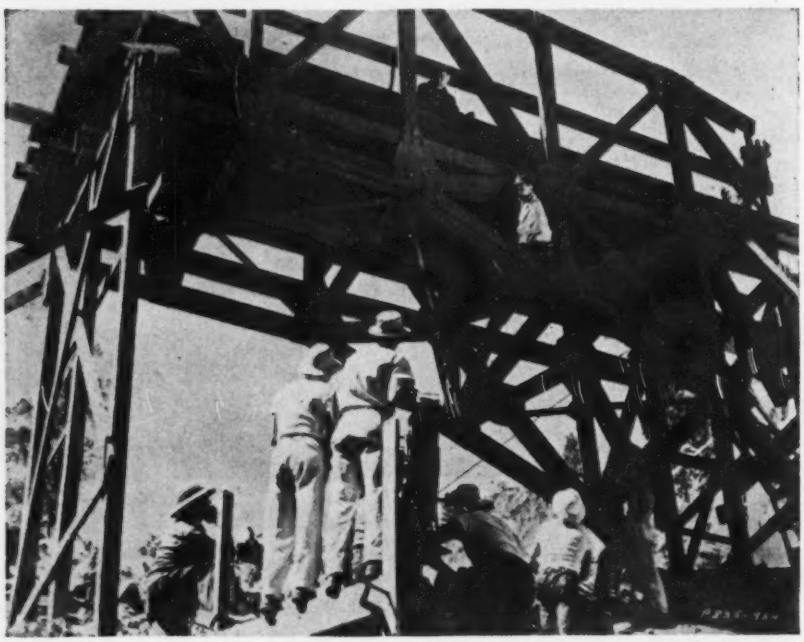
"Until recently, the speed with which new plants were constructed and refineries already in operation were converted to 100-octane gasoline manufacture depended principally upon the progress made in Washington in scheduling the delivery of the equipment required for this work. Now, the bottleneck has been transferred to the plant sites and an acceleration and expansion of field activities is required."

Mr. Miller, a graduate from Swarthmore College with the degree of B.S. in Engineering in 1909, was a construction engineer with the Northern Pacific Railroad during 1910 and 1911. In more recent years he has been president of the Max. B. Miller Co., New York City, which he formed in 1923.

Besides George Gibson and M. B. Fitzgerald, assistant directors, directors have been named for the five districts which cover the entire United States. They are: E. H. Kares, district I, which covers the East Coast; J. E. Rouse, districts II and IV, the Midwest and Rocky Mountain States; D. P. Sturges, district III, Southwest; and George Prussing, district V, Pacific Coast.

Section chiefs, with headquarters in Washington, include, among others: Smith C. Bean, Labor Requirements Section; L. F. Connell, Controlled Materials Section; R. P. Wilson, Priorities Section; and B. K. Wherry, chief of the Power Section.

Mr. Bean is already receiving field reports on labor requirements and availability, and expects to have a nationwide picture of needs within a short time.



Movie producers go in for bridge building

Engineers of Paramount Pictures, Inc., went into bridge building on a large scale when preparing for the filming of Ernest Hemingway's "For Whom the Bell Tolls." The bridge is one of three used in the picture, the other two being road bridges already in existence in Relief Canyon in the Sierra Nevada above Sonora, Calif. Its construction was made necessary by the fact that the bridge used in the climactic scene of the picture had to be dynamited by Gary Cooper, who plays the part of "Robert Jordan," which made it impossible to use one of the existing bridges.

The bridge spans a 300-ft. deep gorge. It was built of rented steel and lumber because of wartime restrictions on new materials.

Price control conspiracy on rock crushers charged

The Federal Trade Commission issued a complaint on Aug. 18 charging two trade associations and certain of their officers and member firms with conspiring to create monopolistic control over prices of rock crushing and other heavy construction machinery.

The complaint alleged that as a result of an agreement and understanding entered into in 1935, federal, state, county and city governments and other purchasers have been compelled to pay increased prices for rock crushers and other machinery used in defense, war and regular programs.

It named the Rock Crushers Manufacturers Association of Cedar Rapids, Ia., the Associated Equipment Distributors of Washington, and their officers, also officers of some of the firms.

• • •

Colorado stops enforcing the 35-mile speed limit

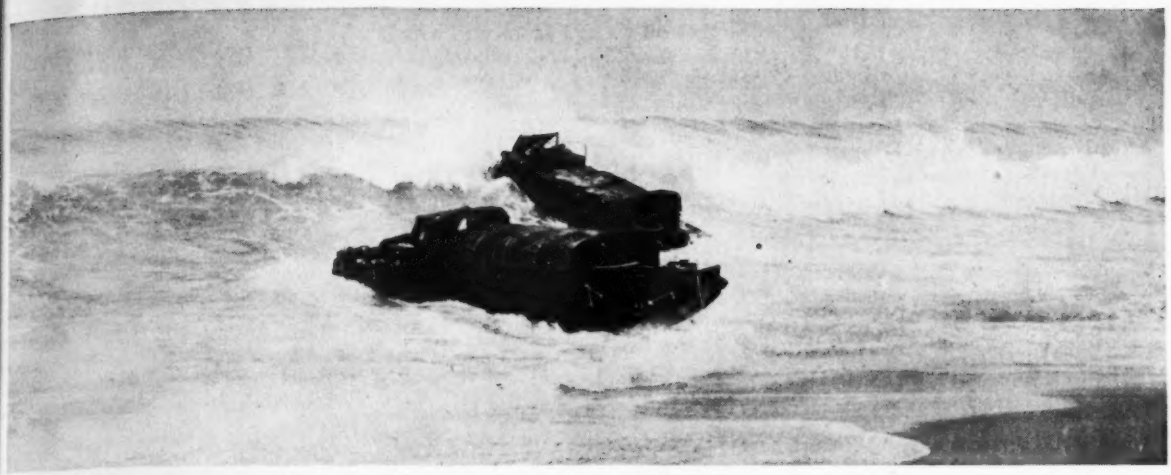
Enforcement of the national 35-mile speed limit law has been abandoned in Colorado where the highway patrol board maintains that an attempt to enforce anything less than a 45-mile limit is wasteful of equipment and manpower. The board predicted a nationwide increase to 45 miles an hour soon by the Office of Defense Transportation.

• • •

North Carolina prisoners needed for road work

The North Carolina State Highway and Public Works Commission on Aug. 16 refused a request of Governor J. M. Broughton that prison labor assigned to highway maintenance be loaned out for farm work in counties where the governor had declared that a critical labor shortage existed for harvesting hay and silage on farms. The commission holds that the prisoners are needed for road work.

D. B. McCrary, chairman of the commission, said: "When the General Assembly authorized the governor to ask for prisoners for farm work we had already felt the decline in the prison population and the difficulty of obtaining free labor was becoming more and more apparent. Two years ago at this time we were using approximately 7,500 prisoners and 10,200 free employees upon the highways. Now we have available for highway work only 4,335 prisoners, and our employment of free labor has declined from 10,200 to 5,900."



"The Duck" proves invaluable for surprise landings where shoals, reefs or sandbars are encountered.

New amphibious truck is the Army's most versatile vehicle

Amphibious action is playing an ever-increasing part in World War II, and the 2½-ton amphibian truck, now in volume production at General Motors truck and coach factories, is giving American armies a growing advantage over the Axis. In the water, it has all the qualities of a large landing boat, plus the ability to keep going when it reaches shoals and shore line. On land, it performs like an army truck, plus the ability to swim lakes and streams.

Carrying cargoes from ocean freighters to inland supply depots; establishing beachheads and bridgeheads; unloading ships where no harbor facilities are available; aiding in reconnaissance work where no roads or bridges exist; carrying or pulling cannon and howitzers; transporting scores of troops or tons of equipment—these are all in a day's work for this sturdy, seagoing truck.

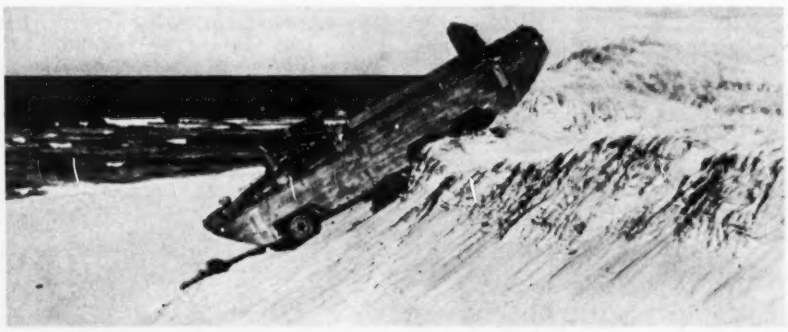
The first descriptions and photographs of this vehicle have just been released by the War Department. Christened "The Duck" by the workmen on the assembly line, it has the same qualities on or off the road that distinguish military trucks, while, in addition, it has the ability to run in and out of water of any depth. True to its name, it is as much at home on water as on land.

Military regulations prevent the disclosure of many of "The Duck's" detailed specifications, but it can be revealed that the boat-like body is mounted on the standard 6-wheel drive chassis, about the same as is furnished the Army for the basic 2½-ton military transport vehicle.

A water-tight steel hull encases the truck frame assembly, below which are mounted the springs, spring brackets and wheels, thus making the unit a motorized boat on wheels.

On land, the unit can be driven through all six wheels. In the water, it is driven by a rear-mounted water propeller. The axle and water propeller shafts pierce the hull through sealed tubes. The steering gear is connected to the rudder, so that the steering wheel guides the vehicle in water. The water propeller thrust is augmented, when desired, by the driving wheels. Thus, the driver can shift control to provide a land or water drive as needed.

The amphibian can readily surmount ordinary difficulties without loss in speed or maneuverability. Where bridgeheads must be forced, the amphibian truck enables a foothold to be established and the waterway to be bridged for the transporting of troops, material and the usual cargo of an invading force. It can also be used in transporting troops and equipment quickly across marshes and rivers.



Steep sandbanks are no obstacle for "The Duck". It can go anywhere.

The amphibian truck can be used for transporting men, guns and equipment.

Extensive war housing work now completed

Completion of war housing during the first half of 1943 amounted to 281,500 units, an increase of 57 percent over the preceding six months. Of this number 71,300 units were constructed by private builders. About 36,000 fewer units were started during the same period than were completed. Of 277,000 units under construction on June 30, approximately one-third were being privately built.

Figures are for all types of war housing construction—family units, dormitory units, trailers, and conversions. Publicly financed war housing now consists almost entirely of temporary structures, and the great majority of it is assigned to the Federal Public Housing Authority, operating unit of the National Housing Agency.

More than 85 percent of private war housing is financed under mortgage insurance written by another NHA operating unit, the Federal Housing Administration. Under NHA, builders of privately financed family units must show that a post-war demand is reasonably certain.

Though the war housing construction program is slated to go forward to the full extent that use of manpower and critical materials will permit, Philip M. Klutznick, assistant administrator in charge of the Homes Use Program of NHA, estimates that more than 600,000 in-migrant war workers in key war industry centers will have to secure living quarters in existing dwellings during the next 12 months. Toward accomplishment of this end, 23 national service, religious, fraternal, and business organizations have pledged assistance to workers in obtaining living accommodations.

• • •

Bids to be called soon on Fort Gibson Dam work

Plans to advertise for bids for the construction of the Fort Gibson Dam on Grand River, Okla., are virtually complete and all the land needed for the dam site has been acquired, Col. F. J. Wilson, district engineer, U. S. Engineers, at Tulsa, has announced.

An appropriation of $8,400,000 was made by Congress in 1942 for the Fort Gibson Dam, primarily as a flood control structure. Colonel Wilson said this fund was frozen when non-essential construction was stopped by the war. The fund now has been released and materials for building the dam will be made available.

The dam will be 2,950 ft. long, 110 ft. high at its highest point and will have an average height of 85 ft. There will be 17 flood gates and 14 other openings, 20 ft. square, to provide for the normal discharge of the river.

Seven 20-ft. high dikes, having a total length of 11,400 ft., will be built along the reservoir shore to prevent flood waters from spilling over into the nearby Verdigris River. The dam will form a reservoir covering 51,000 acres with a length of 38 miles and a maximum width of three miles. Storage capacity for flood control will be 922,000 acre-feet.

A.R.B.A. to push program for postwar highways

E. E. Duffy, formerly with the Wayne County Road Commission, Detroit, Mich., and the Portland Cement Association, has been appointed director of public relations of the American Road Builders' Association to head up the association's accelerated program for stimulating post-war highway construction.

For the last 2½ years Mr. Duffy was planning secretary of the Wayne County Road Commission. Prior to that Mr. Duffy handled general publicity and later highway promotion for the Portland Cement Association for 16 years.

• • •

Another Big Inch break is quickly repaired

On Aug. 19 thousands of barrels of Texas crude oil gushed from a break in a branch line of the Big Inch pipeline near Doylestown, Pa., and spread over farm land. The 20-inch pipe runs from Phoenixville, Pa., to Bayonne, N. J.

State police from Doylestown were hurried to the spot to meet the danger of fire. Dams were erected to confine the oil, which formed a pool, drained into a small lake and flowed into the Neshaminy Creek, killing hundreds of fish.

Officials of the Phoenixville pumping station ordered pumping halted between that point and Bayonne but the oil in the line continued to flow. An emergency crew, however, quickly repaired the break.

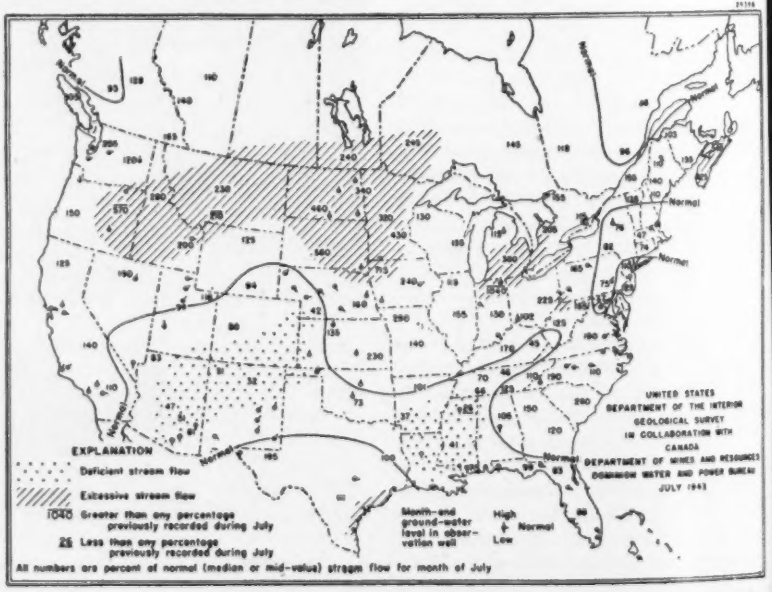
Water supplies were generally favorable at midsummer

Midsummer found the water supplies—ground, surface and storage—favorable to excellent in the northern two-thirds of the United States and Canada.

This year the amount of stored water available for power except in Missouri, Arkansas and Texas equals or exceeds that of a year ago.

Storage for irrigation averages about 112 percent of storage on July 31, 1942, in major reservoirs, used for irrigation in Nebraska, South Dakota, Colorado, Wyoming, Oregon, Nevada and Utah. In Arizona and New Mexico storage for irrigation is less favorable because last year's reserves have been heavily drawn upon. Storage in Lake Mead is 93 percent of last year; San Carlos 57 percent; Salt River system 84 percent, and Elephant Butte and Caballo in New Mexico 62 percent of one year ago. The storage for irrigation in the Southwest is generally sufficient to meet demands.

Total storage in the Ashokan, Schoharie and Croton reservoir system of the city of New York is 219,000 mg. compared with 185,700 mg. one year ago and 218,000 mg. average for July 31. Storage in reservoirs operated for municipal and industrial use in New Jersey, Pennsylvania, Maryland, Ohio and Illinois is generally equal to or above that of last year.


EXPLANATION
Deficient stream flow
Excessive stream flow
1045 Greater than any percentage previously recorded during July
25 Less than any percentage previously recorded during July
Month-end ground-water level in observation well
High
Normal
Low
All numbers are percent of normal (median or mid-value) stream flow for month of July
UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY IN COLLABORATION WITH CANADA DEPARTMENT OF MINES AND RESOURCES DOMINION WATER AND POWER BUREAU JULY 1943
Normal

JOBS OF THE WEEK

HOUSING, Pennsylvania
Rathgeb-Walsh Co., Portchester, N. Y., was lowest bidder for constructing housing, at $906,888 for schedule A and $916,888 for schedule B. Public Housing Authority, New York, N. Y., opened the bids August 16. Gleseon & Mulrooney, Philadelphia, Pa., are the architects.

HOSPITAL, Bridgeport, Conn.
St. Vincent's Hospital, Bridgeport, Conn., awarded a contract to Edward E. Bray Co., Inc., Bridgeport, to construct a hospital wing, nursing home, and peditaric building. The cost will be $815,357. J. Gerald Phelan, Bridgeport, is the architect.

HOUSES, Edmonton, Alta.
Bennett & White, Edmonton, Alta., will build 250 houses for Wartime Housing, Ltd., Toronto, Ont., at $987,000.

AIRPORT, Norfolk, Neb.
Civil Aeronautics Authority, Kansas City, Mo., received low bids for improving airport as follows: from Green & Groesbeck, Minneapolis, Minn., and Booth and Olson, Sioux City, Ia., combined grading, runways and drainage, $638,991; from Peter Kiewit Sons Co., Omaha, Neb., combined bituminous runways, $645,709; from Koss Construction Co., Des Moines, Ia., for concrete runways, $491,510; from Platte Valley Construction Co., Grand Island, Neb., grading, concrete runways, $102,150; also grading, bituminous runways, $103,240; from Empire Contractors, Inc., Omaha, Neb., drainage, $53,363; from Northern Improvement Co., Fargo, N. D., bituminous runways, $366,246.

DETINNING PLANT, Alabama
Johnston & Jennings Co., Cleveland, O., awarded a contract for a detinning plant to H. K. Ferguson Co., Cleveland, O. The estimated cost is $2,000,000. The electrical work was let to Broadway Electric Co., Atlanta, Ga.

IMPROVEMENTS, Ohio
George A. Fuller Co., New York, N. Y., has been awarded the contract to build improvements, Summit County, by Goodyear Aircraft Corp., Akron, O. The estimated cost is $2,000,000. J. Gordon Turnbull, Cleveland, O., is the engineer.

HOUSING, Michigan
James McHugh, Chicago, Ill., was awarded a contract for constructing a housing project, by the Public Housing Authority, Cleveland, O., at $550,006. Andrew B. Morison, Detroit, Mich., is the architect.

MILITARY BUILDINGS, Nebraska
Standard Construction Co., Minneapolis, Minn., will build buildings and installations in Sarpy County for the U. S. Engineers, Omaha, Neb. The estimated cost is $1,000,000.

APARTMENTS, Portland, Me.
Victory Development Corp., Portland, Me., has awarded a contract for 246 frame houses to H. P. Cummings Construction Co., Winthrop, Me., at $1,150,000. William O. Armitage, South Portland, Me., is the architect.

HOUSING, Texas City, Tex.
Snug Harbor Homes, M. A. Silverman, 2816 Plumb St., Houston, will construct by day labor and subcontract 456 homes, including utilities, streets, etc. The estimated cost is $2,052,000. Herman Lloyd, Houston, is the architect.

DAM, California
L. E. Dixon Co., Los Angeles, was the lowest bidder for constructing 203 ft. high, concrete arch dam, with 615 ft. crest, at $1,114,447. The California Water & Telephone Co., National City, opened bids.

HOUSING, California
Stolte, Inc., Alameda, Calif., has been awarded the contract by the Housing Authority of the City of Alameda, for constructing family dwelling units, community building, and two child service buildings, for Estuary War Housing Project, at $2,510,000. Andrew T. Hess, San Francisco, and Carl I. Warnecke, Oakland, are the architects.

HOUSING, Farragut, Idaho
Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded low cost defense-housing work to Sound Kiewit Construction Co., Seattle, Wash., at $616,694.

MARINE BARRACKS, Parris Island, S. C.
Central Contracting Co., Atlanta, Ga., has been awarded a contract by the Bureau of Yards & Docks, Navy Dept., Washington, D. C., for facilities for Marine Corps Women's Reserve, Atlanta, Ga., at $524,893.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 125.

No pipeline to be built across New England

The Petroleum Administration for War on Aug. 19 rejected requests for permission to construct a trans-New England pipeline to run from Albany to Boston, on the ground that it would not materially increase shipments of petroleum products.

The suggested line would have involved 114 miles of ten-inch pipe from Albany, N. Y., to West Boylston, Mass., and fifty-one miles of eight-inch pipe from there to Breed's Island in the Boston area, with capacities of about 50,000 and 30,000 barrels daily, respectively. The estimated cost would have been $5,300,000 and 17,000 tons of new steel would be needed.

Ralph K. Davies, acting petroleum administrator, said disapproval of the project would not reduce the amount of petroleum moved to New England and that existing rail, barge and pipe line facilities were ample to move into that section its full equitable share of the total available petroleum supplies, even in midwinter.

• • •

Removal of bulkheads on Normandie starts

The tilt of the former French liner Normandie has reached a 30-degree angle, and the Navy announce that workers will start at once on the task of removing the concrete bulkheads that divide the vessel's interior into nineteen compartments to facilitate the salvage job (*ENR*, Aug. 22, pp. 92-96).

The huge vessel, renamed the U.S.S. Lafayette, was swept by fire and capsized in February, 1942, at Pier 88 in the North River, New York.

• • •

New international bridge proposed at Laredo, Tex.

Construction of an international, toll-free, high-level bridge to replace the privately owned toll bridge that now connects Laredo, Tex., and Nuevo Laredo, Mexico, over the Rio Grande on the Pan-American Highway, has been made a number one postwar project by the Texas State Highway Commission.

Texas highway engineers are completing plans and specifications for the crossing. Texas State Highway Engineer DeWitt C. Greer is conducting the necessary negotiations for construction of the international bridge. Work will be begun as soon as possible after the war.

OBITUARY

Martin C. Erwin, 63, consulting engineer with the Garrett Engineering Co., died in Houston, Tex., on July 29. Mr. Erwin designed and supervised the construction of many public improvements in Texas during the last 40 years.

Douglas O. Reed, 49, a civil engineer in the Bureau of Evaluation of the Interstate Commerce Commission, died Aug. 20. He earned his engineering degree from George Washington University, served overseas as an engineer during the first World War, and before entering government service was employed as a civil engineer in the railroading field.

James A. Hammack, Sr., 63, died at Leesburg, Fla., on Aug. 9. He received a degree in civil engineering at the University of Missouri in 1904. He worked on the location and construction of the overseas extension of the Florida Coast Railway to Key West. Later he was employed by the state highway department, for the last 23 years as project engineer.

Sydney M. Bryant, 54, instructor in engineering at the University of Kentucky, died in Lexington on Aug. 14. Mr. Bryant had served as a civil engineer with the state highway department for 12 years before receiving a leave of absence a year ago to join the university staff as an instructor in the Army specialized training program.

Oscar Erlandsen, 78, a leader in bridge and tunnel building, died at Huntington, N. Y., on Aug. 17. Mr. Erlandsen's first work in engineering was on the Poughkeepsie Bridge in 1888. He was one of the supervising engineers on the Pennsylvania Railroad Hudson River tunnels, and on the Hudson & Manhattan Railroad's tunnels to New Jersey. During the construction of the Hudson Terminal Building, New York, he supervised the building there of a special pneumatic foundation.

Henry J. Saunders, 63, Washington, D. C., consulting engineer, died Aug. 14. A graduate of the University of Wisconsin.

George C. Irwin, 68, former manager of the George C. Irwin Co., general building contractors, died at Newton Center, Mass., Aug. 12. He established the Irwin organization 32 years ago.

William T. Robinson, 53, for many years a building contractor at Arlington, Mass., died there Aug. 11.

Charles Gillian Huber, bridge engineer of Seattle, Wash., and Portland, Ore., died Aug. 9. He was a consulting engineer and president of the Union Bridge Co.

Briggs Smith, 45, state maintenance engineer of the Tennessee Department of Highways, died at Nashville on July 23. Mr. Smith had been associated with the department for 25 years, having held practically all engineering positions in the department.

James Spotswood Fontaine, professor of civil engineering and acting director of the Experiment Station at North Carolina Station College, Raleigh, N. C., died Aug. 17. Professor Fontaine had been connected with the college for 12 years.

Herman F. Mallow, 74, general contractor of Watertown, Wis., died July 26.

William H. Connell, civil engineer who retired four years ago from the firm of Day & Zimmerman, of Philadelphia, Pa., died at Atlantic City, N. J., on Aug. 3. Mr. Connell had formerly been an engineer for the Pennsylvania Department of Highways and had been executive director of the Philadelphia Tri-State Planning Federation.

Herbert B. Maynard, 84, died recently in Waterloo, Iowa. Mr. Maynard surveyed the towns of Amory and Nettleton nearly 56 years ago for the old Memphis & Birmingham Railroad Company. He was associated with the Iowa Service Commission.

CONTRACTS AND CAPITAL

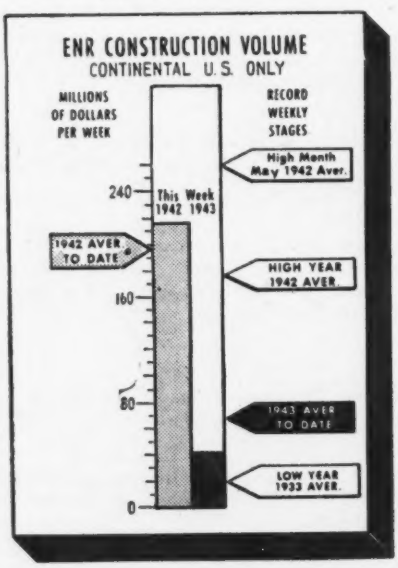
CIVIL ENGINEERING construction in continental U. S. totals $40,638,000 for the week. This volume, not including the construction by military combat engineers, American contracts outside the country, and shipbuilding, is 2 percent lower than in the preceding week, and is 81 percent lower than in the corresponding 1942 week.

Private work, however, is up 51 percent compared with a week ago, and is 49 percent above a year ago. Public construction is 14 percent below last week, and is down 86 percent compared with last year, as both state and municipal work and federal volume are lower.

The current week's volume brings 1943 construction to $2,224,088,000, an average of $65,414,000 for each of the 34 weeks. On the weekly average basis, 1943 construction is 67 percent lower than the $6,919,897,000 for the 35-week period in 1942. Private construction, $283,282,000, is 33 percent lower than in the period last year, and public construction, $1,940,806,000, is down 69 percent when adjusted for the difference in the number of weeks.

In the classified construction groups, gains over last week are in industrial buildings, commercial buildings, and unclassified construction. Gains over the 1942 week are in industrial and commercial buildings.

New capital for construction purposes for the week totals $1,371,000 and is made up entirely of state and municipal bond sales. The week's new financing brings the 34-week 1943 total to $2,926,726,000, a volume 68 percent below the $9,518,744,000 reported for the 35-week period in 1942.



CONTRACTS

Continental U. S. Only
(Thousands of dollars)

	Week Ending Aug. 27 1942	Aug. 19 1943	Aug. 28 1943
Federal	$202,003	$29,570	$26,706
State & Municipal	8,371	4,758	2,870
Total public	$210,374	$34,328	$29,576
Total private	7,424	7,320	11,065
TOTAL	$217,798	$41,648	$40,638
Cumulative 1943 (34 weeks)			$2,224,088
1942 (35 weeks)			$6,919,897

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1942 35 weeks	1943 34 weeks
NON-FEDERAL	$551,846	$272,888
Corp. Securities	164,324	15,408
State & Mun.	176,403	97,347
R.F.C. loans	128,419	9,000
FPHA loans	.....	3,133
R.E.A. loans	.....	20,000
Fed.-Aid Hwy.	82,700	128,000
FEDERAL	$8,966,898	$2,653,838
TOTAL CAPITAL	$9,518,744	$2,926,726

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Aug. '43	291.38	140.07
Building Cost	Aug. '43	228.49	123.51
Volume	July '43	175	77

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Error in Weir Formula

Sir: In the article "A Weir with Flow Proportional to Head," *ENR*, July 29, 1943, p. 198, an error appears in the discharge formula for a Sutro weir, both in the text and in Fig. 2. The square root sign should cover only the term $2g$, not the term $\left(k-\frac{a}{3}\right)$.

The error is probably copied from the paper cited because it first occurred at that time. Attention was subsequently called to the error and a correction published, but it apparently escaped the author's attention.

There is of course little danger that the formula will be incorrectly used. This is fortunate because the error will probably persist forever.

EDWARD SOUCEK,
U. S. Engineer Office,
Wilmington, N. C.

It's the Boss That Counts

Sir: There is much to be said both for and against the WPA. One of its saving features was the way men could, and did, learn or re-learn the habit of work. I pushed several WPA jobs, but hold a brief for nobody's but my own. On my jobs men worked, and nobody drove them to it either. I've handled men in groups of 7 to 125 for over thirty years, and know they can be led, but not driven, to work. An industrious leader will have a working crew. I traveled many states during the WPA years, whenever I saw a loafing crew I knew where there was a no-good boss.

Once, at Killdeer, North Dakota, a stranger asked who was the contractor for the sewer there. Told it was a WPA job he argued "WPA men don't work like that." I told him I knew it was WPA all right because I was its superintendent. One man in the start of the job was found to not know how to work; by persuasion he was taught to drive sheeting. The exercise was good for his health, in a month his eyes brightened, his cheeks glowed, he learned to *like* to work, and by time the job was done he was as good a hand as any.

Since WPA I've been on four defense jobs. They were Army or Navy "Joint Venture" contracts. Per hundred men employed, I've seen far more loafing than ever occurred on any of my WPA jobs.

R. F. MIRICK
Construction Engineer
Evansville, Ind.

Tacoma Narrows Bridge

Sir: Mr. Witmer's letter in your July 15 issue, p. 128, concerning the lesson to be drawn from the Tacoma Narrows Bridge failure strongly advocates deep stiffening trusses for assuring the stability of suspension bridges. His tabulation of ratio of depth of truss to span length ends with the Tacoma Narrows ratio of 1/350 but omits one highly pertinent bit of evidence: the George Washington bridge, *as built*. While it is true that in its final form the ratio will be 1/121 such is not the ratio now when only the top chords of the future trusses and the plate girder stringers, about 5½ ft. deep, are providing longitudinal stiffness. Just how this situation in the deck is to be worked into the tabulation when the cables and towers are those of the final structure is not a clean cut, definite matter. If the stringer depth is used the ratio is 1/636; if the chord only is considered the ratio is about 1/1,300; but in either case the George Washington bridge as built, having been "thoroughly tested and found fully adequate," indicates there is more to the problem of stability than merely to provide the deck with deep stiff trusses.

How the wind passes around or through the deck structure and what forces it imparts thereto in passing is really the essence of the problem. The experimental work being conducted in the special laboratory building at the University of Washington by the Washington Toll Bridge Authority, Charles E. Andrews, principal engineer, under the direction of Prof. F. B. Farquharson, certainly indicates the extraordinary possibilities for stability, at present undeveloped, that exist in shallow, streamlined decks. It may even be the depth of truss to span length ratio of the Tacoma Narrows Bridge that failed may, in a deck of proper aerodynamic form, presently come to be regarded as very conservative.

HOMER M. HADLEY,
Regional Structural Engineer,
Portland Cement Association,
Seattle, Wash.

Don't Be Caught Napping

Sir: In the publication of the Cleveland Technical Societies Council I have just read a resume of the bill identified as S.702 introduced by Mr. Kilgore in the United States Senate.

This bill would mobilize the scientific and technical resources of the nation, and since it would affect the lives of the engineers as well as engineering societies I believe the engineers should have an opportunity to voice an opinion on it. Engineers shouldn't be caught napping as they were when the bill was passed limiting consulting fees to twenty-five dollars a day.

Copies of the bill may be had by writing one of your senators.

ROBERT B. B. MOORMAN
Akron, Ohio

What Engineers Say

"To be an engineer in the fullest sense of the word, a man must recognize and accept his responsibilities to society, and must so design, construct and supervise that his work shall benefit society."—HARRY E. NOLD, *vice president, National Society of Professional Engineers.*

"It is a commonly accepted fact the cultural and scientific training and education are factors that set off this civilization from all others of the past. These have had little meaning in the past when resources were considered inexhaustible, but with the physical frontiers of the world taken up, daring men in science, engineering and management hold strategic positions as explorers and builders of a civilization that can endure. This is our task."—W. R. WOOLRICH, *dean, School of Engineering, University of Texas.*

EDITORIALS

VOLUME 131 NUMBER 9

August 26, 1943

Freight by Air

A NEW CHAPTER in the history of transportation was opened about midnight on Aug. 20 when two planes, one at New York and one at Los Angeles started across country loaded with freight instead of passengers. Freight has been handled by air for several years, but chiefly as an emergency measure. These flights mark the start of regular scheduled service. They are but a sign of what may be expected after the war when plane construction can be directed again toward meeting peacetime needs. Some visionary people see most movements of commodities and persons by air in the postwar period, and visualize the railroads as disintegrating to streaks of rust. Similar unrealized predictions followed the advent of automobiles and trucks. What this new service does presage, however, is a hastening of the revamping of our whole transportation system to fit it more closely to the possibilities of all types of transport that now are available. That revamping is long overdue. It should stand high in the long-range postwar planning.

Not Too Old to Help

AT ABOUT THE TIME the War Department announced that an undetermined number of officers in the Corps of Engineers past the retirement age would be replaced by younger men, the War Manpower Commission issued a revised list of essential occupations that still included civil engineering among the services "urgently needed in war industry and supporting civilian activity." The reason given for replacing the older military engineers is that younger officers have become available to take the older men's places, and that replacement is in the best interest of the service. Explanation probably lies in the fact that the older officers hold high rank, and under the laws that limit the number of officers of a given rank, their continuation in office blocks the advancement of junior officers. Without doubt, this and similar restrictions in existing laws create a difficult situation, but it hardly appears so difficult as to make necessary the complete retirement of many men who can still carry their full share of the war effort when civil engineers, according to the WMC, are badly needed. Transferring them to some body similar to the ill-fated Army Specialist Corps might be the answer. Even though it may be desirable for physical reasons to relieve these older officers from active duty with troops, they can be used as division and district engineers, some of which positions are still held by younger men. Certainly men with their experience and record of service should not be compelled to seek jobs in a war industry in order to have a continuing part in the war.

Low Cost Sewage Treatment

ENGINEERS DESIGNING sewage treatment facilities to serve small communities during the present emergency will find much of interest in the plant to serve 4,500 ordnance workers that is described in this issue. Not only were few critical materials required, but construction was rapid and the cost low. Also, the operation is simple, requiring part-time attention of one man, which is especially important with the present manpower shortage. Much more elaborate treatment was first planned, but those in direct charge insisted that a low-cost plant requiring fewer critical materials and less time for construction be built. The satisfactory operating results that have been obtained with the facilities that were provided are a tribute to the ability of the engineers on the job to analyze the problems to be met.

Higher Stresses for Timber

STRESS INCREASES of 20 percent in structural grades of lumber for buildings that go into effect on November 1 (*ENR* Aug. 19, p. 295), bring that versatile material more nearly in line with stress increases promulgated nearly a year ago for structural steel and reinforcing for concrete. The savings in lumber, fastenings and manhours are expected to be very substantial, as they have been for steel. All of the stress increases are temporary, for the duration only, and technically only for government built, financed or approved structures; but since little other building is permissible, the changes in stresses and simplification of specifications applies to most work now in hand or projected. In using these higher stresses it should be noted that any easing of restriction carries with it a corresponding increase in engineering responsibility. The War Production Board has written into the directives such safeguards as that limiting increased stresses to adequately inspected structural grades of lumber. If safe structures are to be

built, engineers must use extra care in their designs and contractors must see that the lumber they use meets fully all requirements.

Hammer-Welded Penstocks

As MODERN WELDING has developed, it has brought with it methods of proving the quality of the seams by x-rays. Oldtimers, brought up with riveted steel before the advent of x-rays, were long inclined to skepticism about welding. That there may have been good ground for that feeling is indicated by the letter on page 353 of this issue from an engineer who seeks some means of finding the weaknesses that lurk in the old hammer-welded penstocks. The difficulties in making x-rays of existing lines are so great that it is small wonder at least one power company resorted to the speedier method of testing the line with moderate water-hammer shocks. For the duration, probably few power companies can afford to experiment, but when an opportune time comes doubtless the old hammer welds should all be tested with a view to strengthening the weak spots to avoid unexpected shutdowns and costly damage to equipment.

No Safety Nets

TOTAL, ALL-OUT WAR has brought new and unexpected problems to American industry. The construction industry stands today where the machine-tool industry stood several months ago and where other large industries will stand before the war is over. The government had to have machine tools in vast quantities in the early days of its war effort. The industry had to expand to the limit and produce to capacity as it expanded knowing full well that the peak demand would be short lived. Likewise, construction was called on to expand and build at top speed and at a volume approaching double the amount produced in any previous year in order to create the war plants, camps, military bases and airfields needed for the war program. It too could see that the building boom would be of short duration, but it accepted that as inevitable. It asked no safety net to break its fall when it came to set the high girder that was assigned to it in the war structure. It could not expect the government to keep on building war camps and plants just to provide work.

Today, as the task of meeting war needs is spreading into more and more industries and as those needs change suddenly with the demands for changing strategy on the war fronts, the war effort is being slowed measurably by individuals and concerns that hesitate to take their assigned place in the war structure without a safety net. Reading about the cancellation of war contracts or the closing of war plants, they hesitate to take war work or they ask what assurance the government will give them that if they convert their plants to supply war materials they will have orders to keep the plants going. Doubtless no one individual realizes that his hesitancy is slowing the war effort, but the aggregate has now attained serious proportions. Unwillingness to go all out for war with the same do-or-die spirit that animates our bomber crews in Britain is postponing the day when those boys can come home.

In saying that the construction industry went all out for war there is no purpose to assign a holier-than-thou position to that industry. In peace time its operations lack the continuity of most industries; its engineers and contractors take a job and push it to completion and then look for another job. Hence, to them the war job was much like a peace job, just bigger and speedier, normal economies being sacrificed in the interest of speed.

Responsibility for today's condition does not rest wholly with industry; a larger part rests with the government. Its failure until recently to announce a policy with respect to cancelled contracts, its demands for renegotiation of contracts on which the contractors made money while at the same time declining to renegotiate contracts on which the contractor has lost money, and its apparent willingness to investigate the execution of contracts on the most flimsey charges, all have built up a widespread belief that the government itself is unwilling to go all out for war in the same way it asks the individual or the contracting corporation to do.

Now, as never before, is the time to throw everything we have got at the Axis regardless of conditions of which we may rightfully be critical, both within and without the government. Many people may have to risk losing their shirts in the process, but if it ends the war sooner, who will not be willing to take that risk. Safety measures have no place in all-out-war. This is no time to stop to build safety nets under every war-time job. Days lost now may prolong the war for months.

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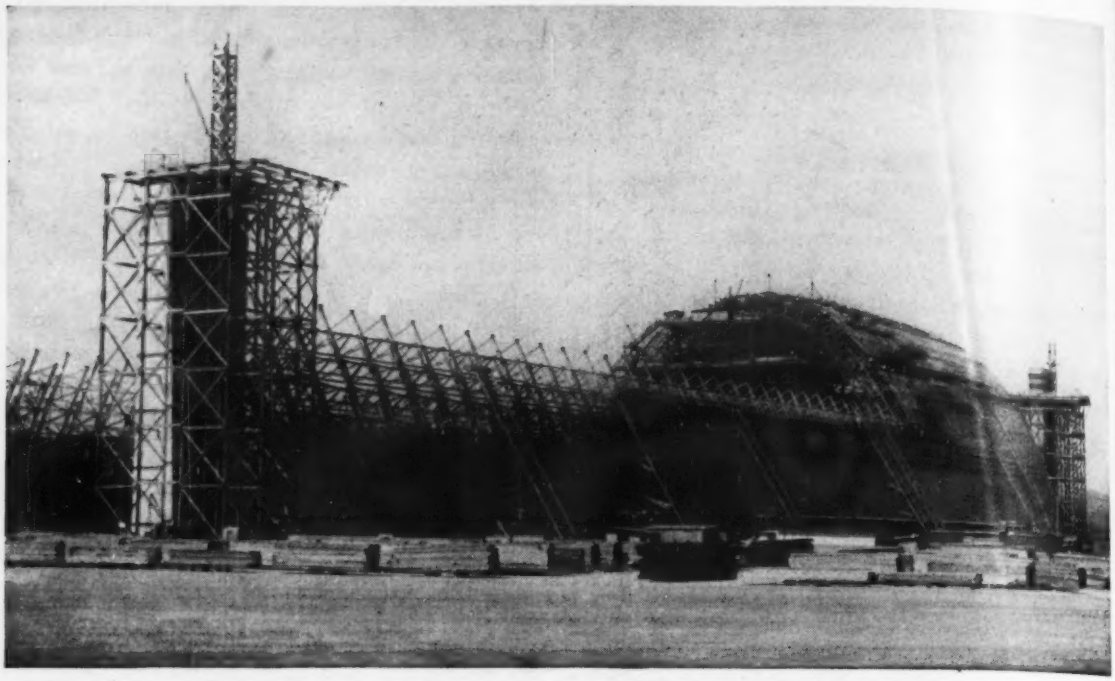


Fig. 1. One of the docks for fleet airships that are said to hold the all-time record for size of a timber structure.

Timber Arches for Blimp Dock Erected from Scaffold on Flatcars

***Contents in Brief**—In contrast with methods used at the Lakehurst Blimp docks, timber arches of 237-ft. span at a west coast Naval air station were erected from a huge timber scaffold carried on eighteen flatcars arranged on six parallel railroad tracks. Progress was 50 ft. per working day. The tracks were used to take the scaffold to a second location.*

THE LARGE DOCKS now being constructed by the Navy for lighter-than-air craft at a number of locations throughout the United States, all follow the same general design but individual structures are adapted to their locations, i.e., in the Southeast the design was governed by wind-load assumptions, in the North by snow loads and in regions of seismic activity by horizontal forces that would be set up by earthquakes (*ENR* Oct. 22, 1942, p. 576).

On one of the first of these docks to be started, misfortune in the form of high winds overtook the job at an early stage, resulting in collapse of the partially completed structure, as described in *ENR*, Feb. 25, 1943, p. 272. However, this setback did not shake the Navy's confidence in the original program; witness the fact that as this is being written, that particular dock is now nearly completed according to the original design and by exactly the same method of construction used at the outset. With the advantage of experience gained prior to the accident, reconstruction has progressed even more rapidly and with full confidence.

A method of construction by traveling tower derricks, used for the dock at Lakehurst, N. J., was described in *ENR*, April 22, 1943, p. 542. In contrast with that method of erection, a plan of construction employing a large timber scaffold, from which the arches are erected, supported on eighteen railroad flatcars 40 ft. long is being carried out at a west coast Naval air station. This method, in addition to providing for speedy forward moves of working platforms at three levels with their equipment and materials, made it possible, when the arches of the first dock were completed, to roll the scaffold across the field to the second dock where duplicate construction was undertaken.

At this station the two docks under contract, each 296x1,000 ft. in plan overall, are made up of 51 timber arches, spaced on 20-ft. centers, each arch having a clear span of 237 ft.

Design of the arches

Of the 3,000,000 b.ft. in the dock, some 750,000 b.ft. is in the heavy timbers in the arches themselves. Heaviest sections in the arches are 6x14s. All arch timbers were precut, bored, grooved, dapped and bevelled at a fabricating plant and while en-route to the job all structural members, including sheathing, were in-

ed and given a fire-resistant treatnt. It was found that incision and atment did not affect the mill work. important joints were made with ber connectors. Typical joint des are shown in Fig. 5.

Principal assumptions were for izontal forces (of seismic origin) 0.1 g; wind loads of 20 lb. per ft. and unit stresses (working load) the timbers of 1,400 and 1,600 lb. sq.in. All timber is Douglas fir. A monorail hoist for use in the inction and repair of aircraft is hung m the arches along the line formed the bottom chord panel points at out the one-third point in the arch n. The hoist loading was assumed 2½ tons, concentrated at one point, not more than one such load beeen any pair of arches.

With loadings thus outlined, the aximum horizontal thrust at the ch haunch figured as 32 kips and maximum vertical reaction 57 ps.

The T-shaped strut that serves as horizontal brace between adjacent ches in the bottom plane of the ords, consists of two timbers spiked bolted together. The bolts are on ft. centers. In the connection beeen diagonal bracing and the horintal T strut, a splice plate in single ear, originally planned for a single olt, a second bolt and a block have en added for greater safety.

The connection between rafters nd the diagonal bracing was made, first, with a bolt through the harply tapering end of the brace. his was unsatisfactory from a pracal standpoint because the tendency split made it necessary to use speial care in bolting up. A change was ade, detailed in Fig. 6, which materially strengthens this joint by putng a 3x3-in. block between the 3x6- diagonals. This gives a firm bearng, bolted through both rafters, and lso clamps the block between the air of diagonals by a bolt parallel o the rafters.

Handling materials

Each structural piece was marked t the fabricating plant, before shipent to the job, to indicate its posiion in the arch or bracing system. his facilitated stockpiling so that the ieces would be conveniently availble in their proper sequence. Members in the lower chord of the arch ere designated by numbers; those n the upper chord by letters.

The mill work was done with moisture content in the timber at or slightly above 25 percent, and the intent was to carry out erection before this percentage had materially decreased by natural seasoning. This plan made possible the carrying through, from mill to erection, a high degree of accuracy in the prefabricated members. Cutting at the mill was laid out to the nearest $\frac{1}{32}$ in. and even after treatment and arrival on the job, variations were found to be not more than $\frac{1}{16}$ in.

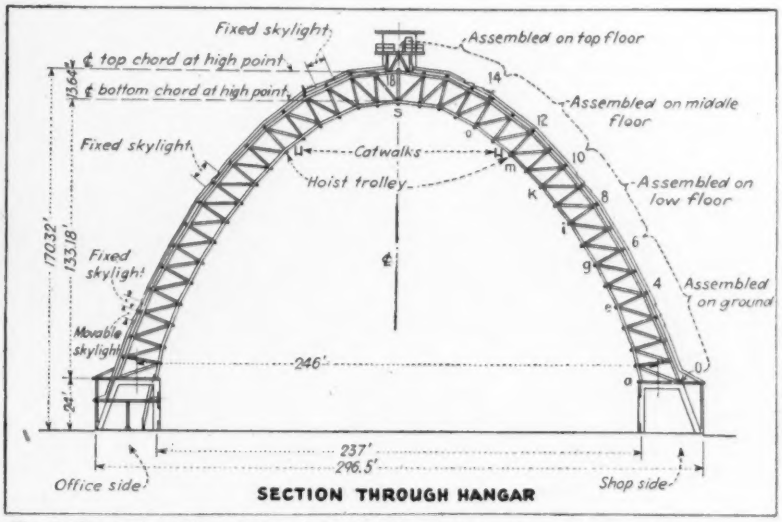


Fig. 2. Typical section of the dock. At the right is shown the erection sequence followed in setting the timber arches.

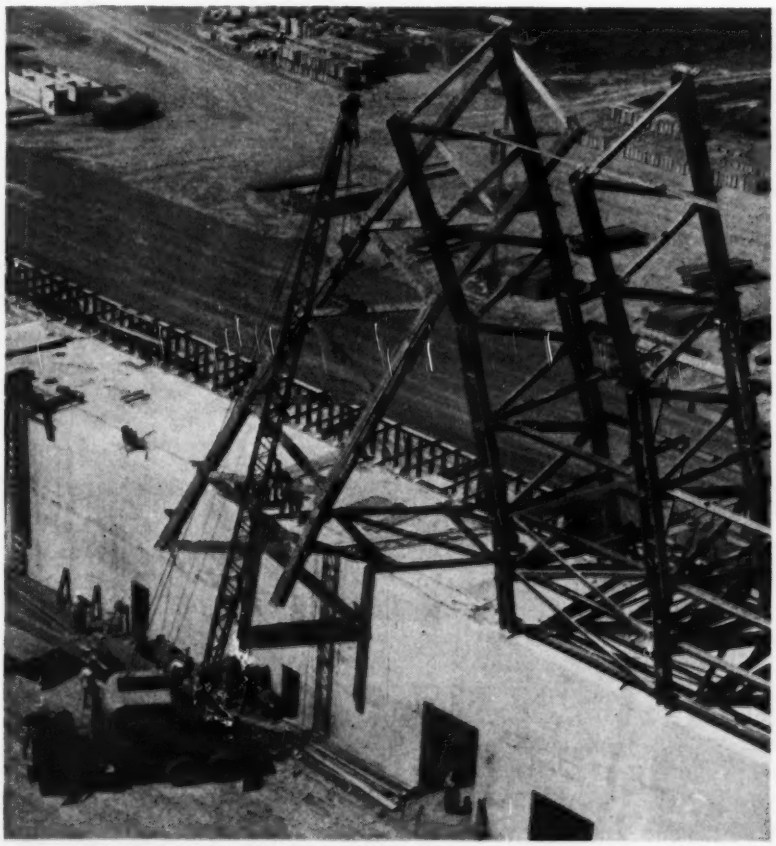


Fig. 3. A 48-ft. cantilever section at the haunch is assembled on the ground and lifted to place by truck crane.

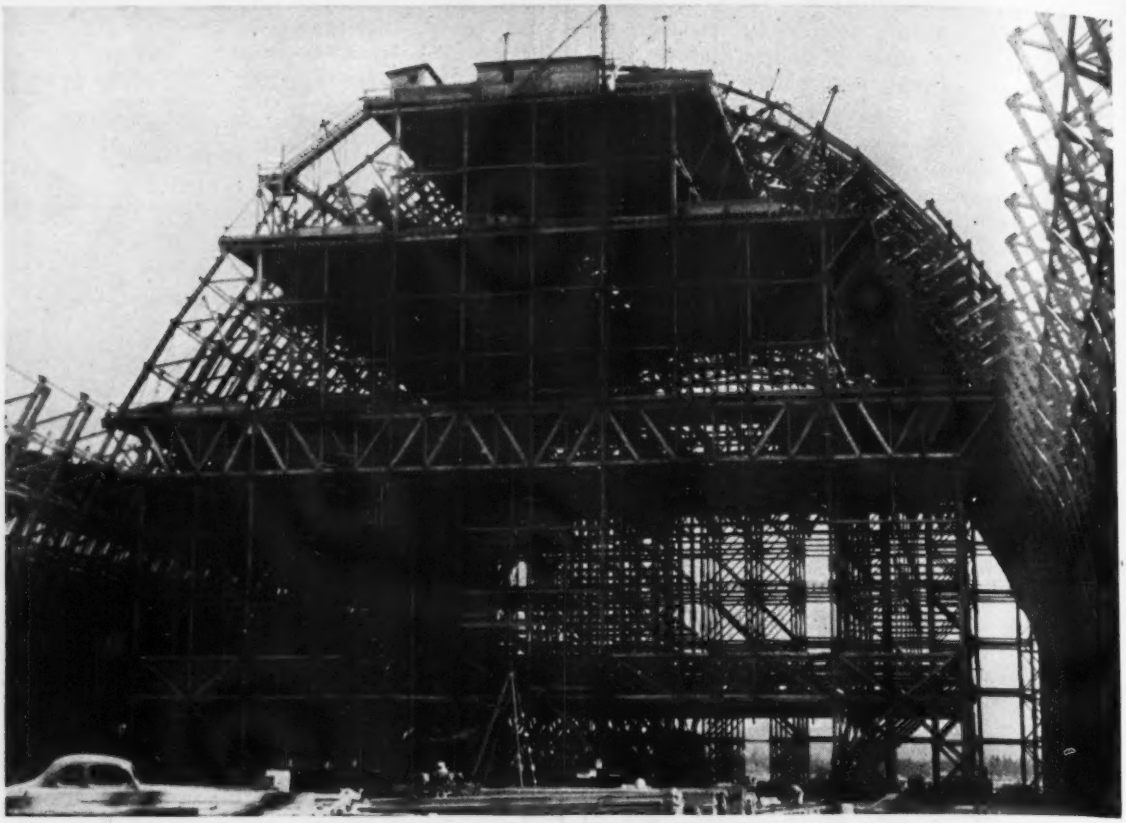


Fig. 4. The lowest of three working platforms on the scaffold is near the top of the cantilever section of the arch. Upper sections are assembled on the platforms and are set by gin poles on the scaffold.

The construction plan based on use of a rolling scaffold simplifies the accurate placement of the arch sections by materially shortening the lift, because each section is put together on a platform very close to the final location in the arch. A conveniently placed gin pole (there are two on each of the upper platform) can set the segment accurately. Because of the short lift and the convenient location of the working platform just under the arch, workmen have continual and easy access to all parts of the arch rib during its erection.

The scaffold is 120x210 ft. in plan and the supporting, 40-ft. flatcars are coupled together in six, three-car trains but there is no lateral connection between these trains other than that provided by the scaffold itself. Couplings between cars were first packed tight and then blocked.

Three working platforms or stages are provided at convenient levels on the scaffold. The first, opposite 6-g on the truss, is 78 ft. above rail head, the second at 10-k is up 118 ft. and the third, at 14-o, is up 144 ft. Up to the first stage the scaffold consists of framed tower construction (Fig. 4). Above that level it is built of posts and girders. The stages provide horizontal stiffeners in the structure and in two vertical planes the timber panels are stayed with diagonal bracing of steel rods.

The advantage of steel rods as compared to the more rigid construction that would have resulted from timber diagonals becomes apparent in the operation of jacking the scaffold ahead.

Moving the scaffold

When the scaffold is to be moved, car movers are operated by workmen between rail head and tread of the last wheel on each rail. The propelling effort is synchronized by the foreman's whistle. The effort required is increased very materially when a "head wind" is blowing. A person high up on the scaffold during moving in a strong wind can feel a slight "whipping" movement of the structure caused by its adjustment to the force of the head wind opposing the forward thrust. It is believed that the steel diagonals give the structure the needed resiliency for all such movements.

The scaffold is moved ahead 20 ft. as often as one of the arch ribs is completed. As this is being written the average progress is 50 ft. (two and three moves alternating on successive days) for daily 9 hr. shifts. Although moves against head winds take somewhat longer, the average moving time in quiet air has been 7 minutes.

In order that moving operations would not interfer with erection, it was found desirable to rest the uncompleted portion of an arch rib against the scaffold on a movable support. This was accomplished by fastening to the scaffold a 6x$\frac{3}{4}$-in. steel strip, to serve as a track, in a plane normal to the arch load at the 118-ft. height. On this track the arch load is carried by a pair of rollers supporting a screw jack that aids in adjusting the arch position accurately.

From the roller-mounted jack a 3x12-in.timber extends back 20 ft. to the last completed arch. When the scaffold starts to move ahead the weight of the uncompleted arch con-

tinues to be carried by the moving scaffold because the steel track slides ahead under the rollers.

The three stage levels on the scaffold were located with a view to providing the easiest possible access to field connections where the arch segments are put together. There is space on each stage for assembling the section next above this stage. Thus, the accurately prefabricated materials are hoisted to each stage as they are needed and assembly is done by crews that soon become highly proficient in repetitive operations.

Of the two gin poles on each staging the one at the forward end is used primarily for bringing up materials while the other, close to the line over which the arch rib is erected, is used chiefly for handling arch segments. A combination king pin and hinge mounting for the gin poles permits a free swing. There are no hoists on the bottom stage because the first or cantilever segment of each arch is placed from the ground.

Sequence of arch assembly

The first arch segments, 48 ft. long and including all members up to 6-g, (Fig. 2) are assembled on the ground and lifted by motor cranes to position on their supporting A-frames of concrete 24 ft. high. The length of this cantilever segment was determined by the base connections, i.e., the length was made a maximum that could be left standing in place as a cantilever without overstressing the base connections.

Above the top of the cantilever section (which is close to the lowest scaffold stage) are three successive segments in each half of the arch. Bracing between the arches, including purlins and T struts, is also assembled on the stages and lifted into place as units.

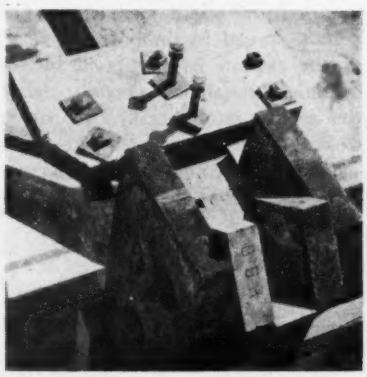
In this latter operation very important functions in the crown of the arch are performed by a Chicago boom on a traveler or "crown hoist" that rolls along the monitor beams capping the crown of the arches. This rig lifts the monitor beams into position from the top working stage, places the vertical bracing between a newly placed arch and the one last preceding, and hoists to the roof top the sheathing for a 30-ft. width of the roof on either side of the center line. This crane can also pick up from the ground at the rear end of the structure. It was especially designed for this job and is operated by an electric hoist. Its convenient location and multiple services contribute notably to progress at the crown of the arch.

To the purlin trusses are bolted 3x12-in. rafters on 6-ft. 8-in. centers parallel to the arches. To the rafters are nailed the 2-in. t&g. sheathing which comes in random lengths. Up the steep sides of the roof the random lengths were put on with joints wherever they happened to come. On top of the arch, i.e., for 30 ft. on either side of the crown, the sheathing was cut to make joints over the rafters.

Everything done to the arch, including placement of catwalks, monorails and electrical conduit and reflectors, is completed before the scaffold draws out of range. This is desirable because it is extremely difficult to get workmen to go out on the arch ribs after the scaffold has moved away from beneath them. By completing the work of all crafts before moving the scaffold, no other staging is required.

Construction of the box beam girders for carrying wind load at the top of the 120x220-ft. doors at either end of the dock will be treated in a subsequent article.

The design for these docks was developed by the Bureau of Yards & Docks, Navy Department. Rear Adm. Ben Moreell, chief of the bureau; Capt. A. K. Fogg is public works officer, 11th Naval District. Lieut.-Comdr. G. M. Gans is resident officer in charge of construction. The general contract for construction is held by James I. Barnes, Santa Monica; William Osborne, superintendent. Summerbell Roof Structures is the subcontractor on furnishing and erecting of timber arches; A. G. Bissell, superintendent. All prefabrication is by Timber Structures, Inc., Portland, Ore.



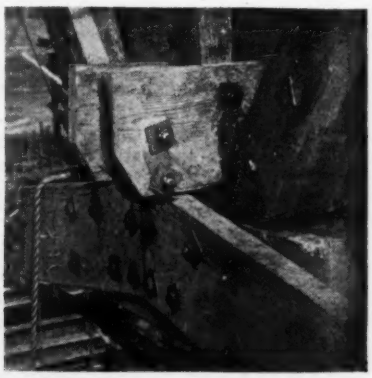


Fig. 5. Typical details of timber joints; all are made with split ring or shear plate connectors.

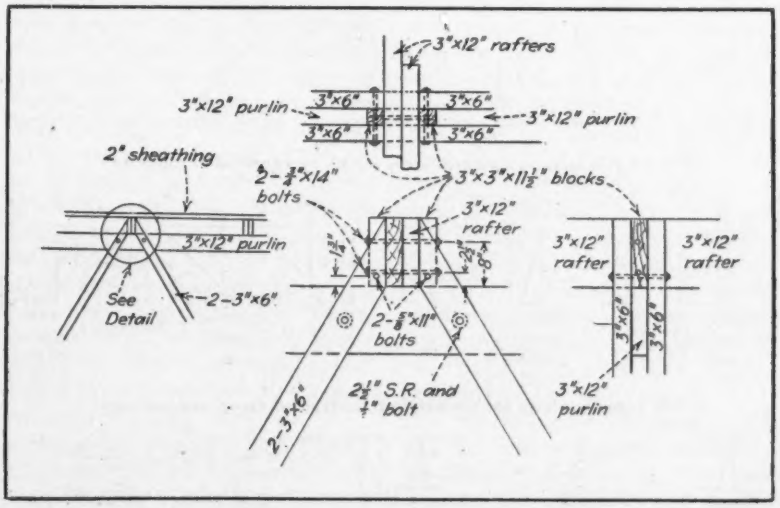


Fig. 6. Revised form of rafter-brace connection that simplifies and strengthens that type of joint in the framing of the dock.

Analogy for Horizontal Forces on Partially Buried Structures

Hugh M. O'Neil
Structural Engineer, Donald R. Warren Co., Oakland, Calif.

PROBLEMS pertaining to lateral bearing values can be simplified materially by an approach somewhat different from the standard method. Making use of an analogy to the standard method and following through mathematically to develop equations that can be expressed in terms of horizontal soil pressures leads to a method of analysis, outlined in the following, quite useful in practical applications.

When it is necessary to determine the lateral bearing pressures on the soil around an object partially embedded in the ground, such as a post or a pier subjected to a lateral force, certain theoretical assumptions must be made as the basis for analysis. The usual procedure in making such assumptions is shown diagrammatically in Fig. 1. On the basis there indicated formulas are derived for maximum values of horizontal soil pressure resulting from the horizontal load. In these basic assumptions resistance of the soil to deformation is taken as varying directly with depth, indicated by the straight line in Fig. 1-b. Multiplying the passive resistance per unit deformation by the deformation under the given load, we obtain unit lateral pressures in the soil.

Using these same theoretical assumptions, an analogy can be drawn, as indicated in Fig. 2, which simplifies the problem considerably, especially when applied to sections of non-uniform width such as a pier with a spread footing. If the width of the section is multiplied by the triangle of resistance, a resulting effective section is obtained. This can be treated as a beam or column subjected to the combined bending and direct force $\frac{P}{A} \pm \frac{Mc}{I}$. (Resistance may be taken as 1.0 of the bottom for all cases.)

If M is taken as P times the distance to the center of gravity of the effective section (Fig. 2), the "unit combined stress" at any point at a distance r from the center of gravity becomes: $\frac{P}{A} \pm \frac{Mr}{I}$. When this is multiplied by the resistance at the point in question the value for the unit horizontal soil pressure is obtained. Stated in equation form this becomes:

$$p = \left(\frac{P}{A} \pm \frac{Mr}{I}\right)\frac{y}{D} \qquad (1)$$

Where p = unit horizontal soil pressure (lb. per sq. ft.) at depth y
I = moment of inertia of the effective section in feet⁴.
A = area of the effective section in square feet.
y = depth in feet, to the point at which the horizontal soil pressure is to be determined
r = the distance in feet either up or down from the center of gravity of the effective section to the point in question.

The logic of this becomes apparent when one considers that the effective section of Fig. 2-c has the same resistance to deformation at all points as the rectangular section shown in Fig. 1. The former is a rectangular section with a triangular distribution of resistance or modulus of elasticity, E. The latter is a triangular section of constant E. As far as resistance to deformation is concerned the two cases are identical. This is another way of saying that the pressure curve shown by Fig. 1-e (which is, in effect, a curve of resistance to deformation) is the same for both cases. Hence, the analogy.

Since Fig. 1-e represents total pressure per unit length, it is equal to the unit pressure curve of Fig. 1-d times the width of the section. Similarly, for the analogy it is seen that the value of any point on Fig. 1-e is equal to the corresponding value for the combined stress curve of Fig. 2-e times the width of the effective section at that point or $W.y/D$. This product, in turn, must be divided by the width of the actual structure W, at the point in question to obtain the unit horizontal soil pressure. To ob-

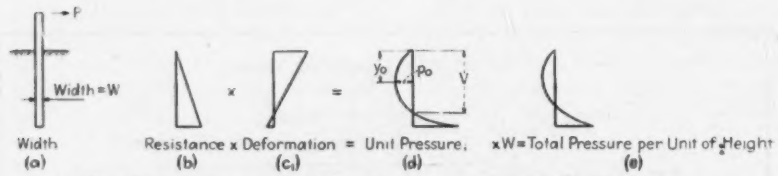


FIG. 1. Basic assumptions ordinarily made, represented by diagrams

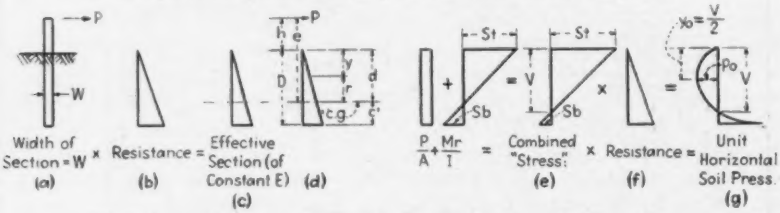


FIG. 2. An analogy for simplifying horizontal force assumptions

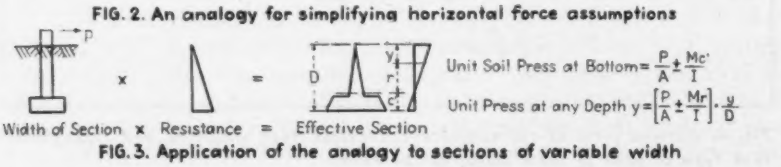


FIG. 3. Application of the analogy to sections of variable width

tain unit horizontal soil pressure, therefore, the stress value from Fig. 2-e must be multiplied by $\frac{W\frac{y}{D}}{W}$ or $\frac{y}{D}$ as is done in equation (1).

Upper limit of soil pressure

In working problems of this nature it is convenient to know that the upper maximum unit soil pressure, p_o, will occur at a depth of $V/2$. This can be demonstrated by reference to Fig. 2. Unit horizontal soil pressure at any depth y will be:

$$p = S_t\frac{V-y}{V}\cdot\frac{y}{D} = \frac{S_t}{D}y - \frac{S_t}{DV}y^2$$

Differentiating for maximum,

$$\frac{dp}{dy} = \frac{S_t}{D} - 2\frac{S_t}{VD}y = 0$$

$$\text{and } y = y_o = \frac{V}{2}.$$

Since Fig. 2-e and 2-f are straight lines for all conditions it will be seen that the expression $y_o = \frac{V}{2}$ is general and applies to irregularly shaped sections.

The analogy can be used in the derivation of formulas for constant width sections by considering the effective section of Fig. 2 and assuming W equal to 1. Then, by substitution, we have the "stress" at the bottom, Sb, expressed as follows:

$$Sb = \frac{12Ph}{D^2} + \frac{6P}{D} \qquad (2)$$

And at the soil surface stress, St, becomes:

$$St = \frac{24Ph}{D^2} + \frac{18P}{D} \qquad (3)$$

By similar triangles and substituting values from equations (2) and (3) and reducing we have:

$$V = \frac{3D^2 + 4Dh}{6h + 4D} \qquad (4)$$

Since maximum soil pressure occurs at depth $\frac{V}{2}$

$$\text{Stress} = \frac{St}{2} = \frac{12Ph}{D^2} + \frac{9P}{D} \qquad (4a)$$

Now reducing equation (1) and substituting from equation (4a):

$$p_o = \frac{3P\,(3D + 4h)^2}{4D^2\,(2D + 3h)} \qquad (5)$$

As far as the writer knows, formula (5) has not been presented in American texts. It is quite convenient to use because it gives values of p_o directly.

The incorporation of the formula for allowable passive pressure in the above equations will give expressions which are ready for actual application by the designer. The common value for ultimate passive pressure is:

$$p_s = C_p wy$$

Where C_p = Rankin's passive pressure constant.
w = the weight of soil in pounds per cubic foot.
y = depth to the point in question in feet.
p_s = amount of horizontal pressure (lb. per sq. ft.) that soil can withstand

As shown in equation (1) the value of soil pressure at depth y, is

$$\left(\frac{P}{A} \pm \frac{Mr}{I}\right)\cdot\frac{y}{D}$$

and the ratio of the horizontal soil pressure to the ultimate passive pressure is:

$$\frac{p}{p_s} = \frac{\left(\frac{P}{A} \pm \frac{Mr}{I}\right)\cdot\frac{y}{D}}{C_p wy} = \frac{\frac{P}{A} \pm \frac{Mr}{I}}{C_p wD} \qquad (6)$$

At depth y_o where the upper maximum soil pressure occurs, the expression for sections of uniform width reduces to the following:

$$\frac{p}{p_s} = \frac{12P}{D^2C_p w}\left(\frac{h}{D} + \frac{3}{4}\right) \qquad (7)$$

At the bottom, for uniform sections,

$$\frac{p}{p_s} = \frac{12P}{D^2C_p w}\left(\frac{h}{D} + \frac{1}{2}\right) \qquad (8)$$

It is interesting to note that since the denominator of equation 6 is constant, the value of $\frac{p}{p_s}$ is directly proportional to $\frac{P}{A} \pm \frac{Mr}{I}$ and therefore directly proportional to the "combined stress" diagram of figure 2e. It is apparent, therefore, that the critical value of the $\frac{p}{p_s}$ ratio occurs at the soil surface for most cases. For sections of uniform width, the ratio at the soil surface becomes:

$$\frac{p}{p_s} = \frac{24P}{D^2C_p w}\left(\frac{h}{D} + \frac{3}{4}\right) \qquad (9)$$

The design assumptions used herein are widely accepted and are within the limits of accuracy justified by the nature of the problem. Application of the above formulas to any given design, however, will require sound judgment and careful consideration by the engineer of the many uncertainties of actual field conditions.

Increasing the Reflectivity of Concrete By Additions of High-Calcium Lime

C. W. Muhlenbruch and Ben Marcin of Carnegie Institute of Technology in a joint paper before the recent annual meeting of the American Society for Testing Materials described laboratory studies to increase the reflectivity of portland cement concretes by additions of high-calcium lime. An ordinary portland cement was used and the fine aggregate was of two types, a light brown Allegheny River sand and a commercial white sand. The coarse aggregate was Allegheny River gravel. The lime was added in proportions of 10, 15, 20 or 30 percent by weight of cement to a base mix of 1:2:3 by volume with a water-cement ratio of 7 gal. per sack of cement. (The lime was *added* to the concrete mix and did not *replace* any cement.)

Reflectivity specimens, 8 in. square and 2 in. thick, were cast in cardboard boxes which had been dipped in liquid Pyralin.

When hydrated lime was added to the mixes in various proportions, it was necessary to increase the water content above that of the base mix to give a slump equal to the 4½-in. slump of the base mix.

Conclusions from the work were:

1. Concrete of suitable, although not a maximum, reflectivity can be obtained using ordinary portland cement, a light colored fine aggregate, and hydrated lime.

2. When 30 percent by weight of hydrated lime is added to ordinary gray cement concrete made with river sand, the reflectivity of the troweled surface may be expected to increase from a reflectivity of 25 percent to a reflectivity of 34 percent. When the same quantity of lime is added to an ordinary concrete made with white sand the reflectivity of the troweled surface may be increased from a reflectivity of 44 to 53 percent.

3. When subjected to atmospheric exposure, ordinary concrete containing lime may decrease 40 percent in reflectivity but not as much as concrete made with white cement.

4. Severe cycles of freezing and thawing will reduce the reflectivity of cement concrete containing lime. The average reduction of 8 percent is much less than that observed for concretes made with white cement.

Fig. 1. Appearance and usefulness of the Liberty Tunnels were improved greatly by addition of a white glazed tile lining along the sidewalls, installation of new sodium-vapor lighting units and reconstruction of the roadway pavement. Two of the three rows of floodlights at the entrance to the southbound tube are shown.

Pioneer Highway Tunnels Modernized for Service

Contents in Brief—*The twin, 5,889-ft. long Liberty Tunnels at Pittsburgh have been modernized by a new drainage system; new roadway slabs; a 9-ft. high glazed tile lining at each side; new lighting; improved approaches, and new carbon monoxide recorders. Work continued 13 months and required that each tube be shut down for several months but not concurrently.*

PITTSBURGH'S LIBERTY TUNNELS, famous as the pioneer in long twin-tube street tunnels, have been transformed into one of the handsomest of modern city tunnel thoroughfares by a comprehensive modernization operation. Built a score of years ago, when the brilliant palatial interiors of today's street tunnels were little thought of, the Liberty Tunnels have long been dim-lighted, drab colored trips for motorists. In addition time had exacted its toll in deteriorated lining and pavement until repair and reconstruction were required.

With so much to be renewed it was decided to make the modernization comprehensive by extending the improvement to new lighting, water service for washing and fire fighting, drainage, noxious gas detection, traffic controls and other services besides the new pavement and lining reconstruction. The revamped tunnels now in operation have materially increased the flow of traffic and eased the labor of maintenance.

The Liberty tunnels pierce the high escarpment that borders the south bank of the Monongahela River across from Pittsburgh. By way of the Liberty Bridge over the river and the tunnels, Pittsburgh traffic has access to the suburban residence section on the far side of the high bank of the river. One tunnel takes traffic from and the other to the city; each has two traffic lanes.

The tunnels, 5,889 ft. long, were of record length when built, and today are longer than but a few vehicle tunnels. They consist of two parallel tubes 59 ft., c. to c., with 11 connecting cross-passages on about 500-ft. centers. The upper part of each tube is a semi-circular arch, with a radius of 13¼ ft., supported on battered sidewalls 6½ ft. high above the roadway curbs; the height of crown above the pavement is 20 ft. 7 in. The roadways, which are sloped downward toward the north ends on a 0.229 percent grade, are 21 ft. wide and a 4-ft. sidewalk borders each on the right hand side in the direction of traffic.

When originally completed the 2-ft. linings of the tunnels were finished to match the natural color of the concrete which darkened with time. Also the lighting then held adequate was far from giving the degree of illumination that is now considered desirable. The result has been gloomy interiors that have contrasted sharply with those of tunnels built later. Soon after construction, interior appearance was further marred by leakage through the unsealed construction joints of the lining. Wet spots on the lining in warm weather, and icicles and ice in winter were the results. To wash the walls and pavement was difficult because all the waste water had to run to the north portals on a pavement of little slope. Then, added to leakage troubles, inadequate wall and under-floor drainage had built up heads of water at places and there had been pavement settlement over soft spots. Naturally pavement deterioration after 20 years was also evident; in particular traffic, which at times rises to peaks of 3,600 vehicles per hour per tube, had deeply rutted the pavement.

With the condition of the old structure as indicated, renovation to modern standards called for the planning of several major operations. Briefly summarized, these were: (1) Construction of new paving, installation of a comprehensive drainage system and addition of adequate water supply for washing; (2) sealing the leaks in the lining, coating the lining with a black bituminous spray coat, installing white tile sidewall interlinings for the full length of each tube, and adding a white enameled steel ceiling lining for 200 ft. at the entrance of each tube; (3) complete revamping of the lighting system; (4) modernization of the carbon-monoxide recorders; and (5) improvement of both approaches.

The only drainage system provided in the original construction was composed of broken stone and gravel placed along the sidewall over a 6-in. clay pipe behind a part of the lining only. It was found that this drain was no longer functioning and was practically worthless. Complete new drainage was required and this, with details of water main and new paving, is indicated by Fig. 2.

Under each roadway a 12-in. dia. clay pipe with open joints was added to provide adequate drainage. This drain was located near one side of the slab and placed in coarse gravel in a trench about 2 ft. wide and 3 ft. deep. At about 270-ft. intervals, 10-in. dia. vitrified tile cross drains of similar construction were installed. At each intersection of the transverse and the longitudinal drains, brick manholes were built, and at each side of the roadway storm-drain inlets were installed (Fig. 4).

In paving the southbound tube the old pavement, which was a 9-11-9-in. slab, was left in place, and over it was laid a 5-in. slab of 1:2:4 concrete with a $1\frac{3}{4}$-in. max. size aggregate. To add the under drains the old pavement was trenched as shown by Fig. 4. At the center of this slab a continuous 6-in. wide strip of white concrete was used.

Experience in paving the southbound tube indicated that a better and more lasting job would result by removal of the old pavement to permit better subgrade compaction. Thus, in constructing the drainage facilities for the northbound tube, the old roadway slab was broken up, the greater portion of the material removed and a new reinforced-concrete pavement of 9-in. uniform thickness and 2-in. crown added. This slab was built of 1:2:4 concrete with $2\frac{1}{2}$-in. max. size aggregate. A 6-in. center strip of alternate 5-ft. sections of black and white concrete was installed. (The short time the repaired tubes have been in service indicates the alternate black-and-white strip to be preferred, as it is distinctly more visible). The new roadways were constructed of transit-mix concrete and one lane of one tube was paved at a time, the tube being closed to traffic until the work was completed.

To permit cleaning of the tubes, and to provide a system of fire protection, the 6-in. dia. steel water main that had been installed on one curb was replaced by a 6-in. cast iron main. This pipe was laid in the longitudinal drainage trench. Connections were provided to hydrants in each passageway between the tubes or at about 500-ft. intervals. To provide sufficient pressure for fire protection and washing purposes, a booster pump was installed in the maintenance room between the tubes at the south end of the tunnels. The pump increases the pressure at the hydrants to 100 psi.

In placing the original lining, the construction joints were not sealed and the flow of water through these joints was considerable. This flow not only caused discoloration of the concrete, but created a hazard to traffic from wet pavements and the formation of icicles on the roof.

Thus, a major part of the modernization of the tunnel was repair of the joints and cracks where leakage had occurred. First, the old concrete for a short width at each joint was removed with a mounted pneumatic drill. Then the exposed concrete was covered with a thin layer of bituminous cement of special composition, and the cavity filled with special waterproof mortar. The special compounds used were patented products sold under the trade names of Igas, Igol and Sika. In some cases steel mesh was fastened to the concrete wall by steel dowels and the opening was filled with shotcrete cement mortar.

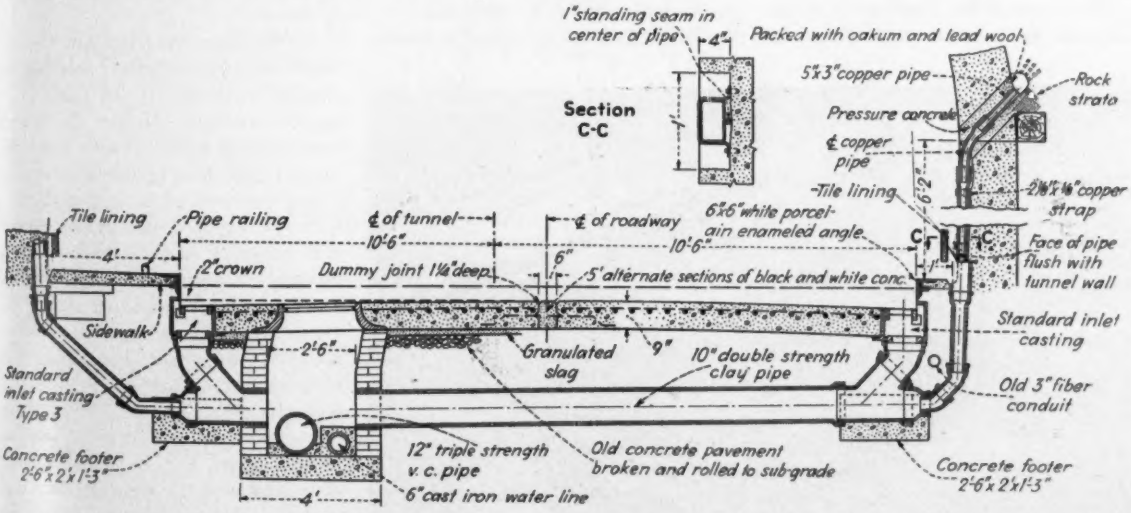


Fig. 2. In repairing the northbound tube the old roadway pavement was broken up, the greater portion removed and a new drainage system and roadway constructed. The inlets are spaced on about 270-ft. centers along the curb. Concentration of water behind the old concrete lining is eliminated by addition of frequent intervals of drains of type shown at right. In southbound tube new drainage facilities are similar but new pavement was placed on old slab.

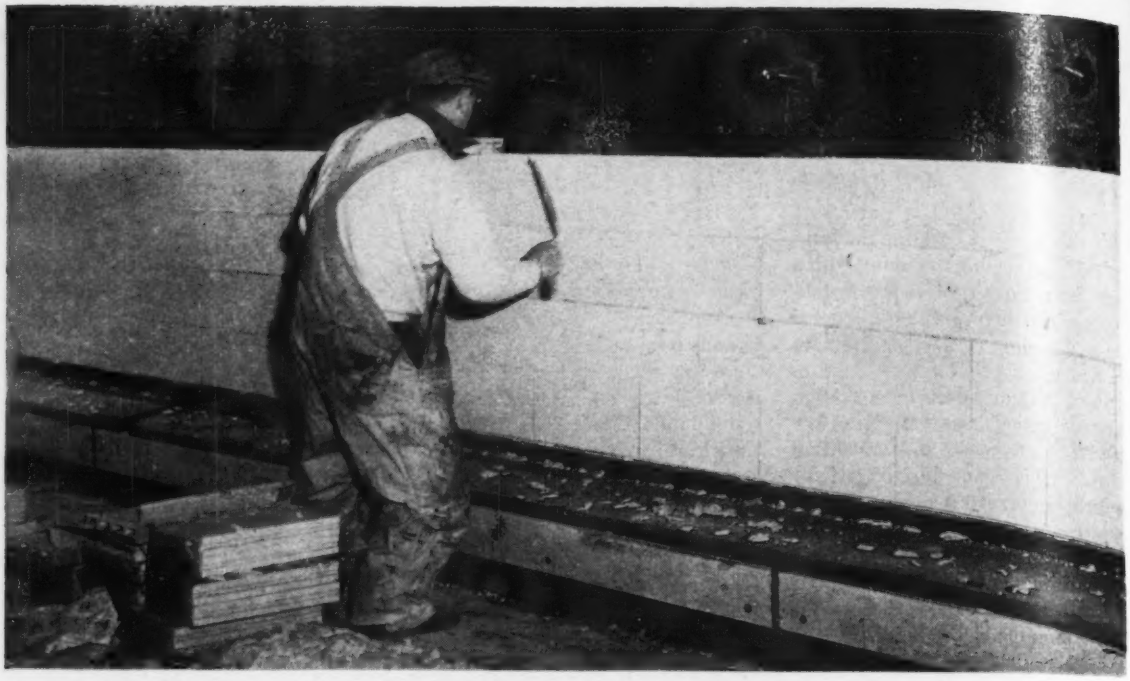


Fig. 3. Along both sides of each tube a 9-ft. high glazed tile lining was installed. Non-corrosive anchors of the type shown by Fig. 5 tie the tile to the concrete lining on 4-ft. centers vertically and 5 ft. horizontally.

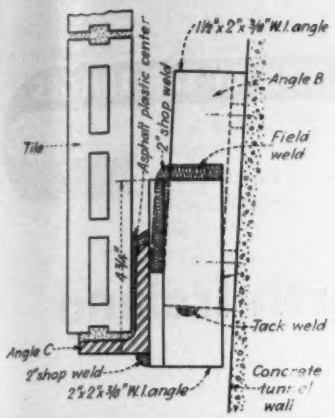
After the joints had been sealed, the roof and walls were covered with tar paint. Specifications called for three coats of absorptive tar followed by two coats of black coal tar pitch paint, all applied by spray gun. The amounts of each used approximated 0.20 gal. of absorptive tar per 100 sq.ft. per coat; and 0.18 gal. of pitch paint per 100 sq.ft. per coat. The area of surface thus treated was 639,375 sq.ft. or more than 14½ acres. The cost was 5¾c. per sq.ft.

To improve the appearance of the tunnels and increase the lighting intensity, a 9-ft. high tile inter-lining was added at each side. This lining (Fig. 3) was built of 8x16-in. vitreous glazed tile of low absorptive properties. The glazed face of the tile had to be as near to a flat surface as possible for neat appearance. Since the old concrete sidewalls were not perfectly straight, to tie the tile to the concrete lining the special adjustable, non-corrosive anchors of the type shown by Fig. 5 were devised They were spaced on 5-ft. centers horizontally and 4 ft. vertically.

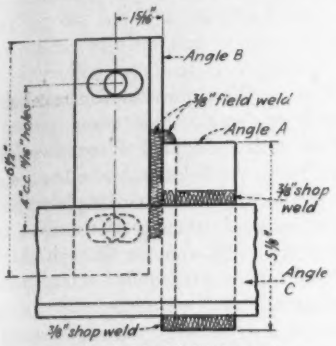
So that condensation and moisture penetrating the concrete side lining would travel down the concrete walls and into the drains, a continuous wrought-iron shelf angle supports the tile wall about 6 in. above the curb. The tile wall was built in 30-ft. long sections and a ½-in. premoulded cork filler of a color to match the mortar between the tile was inserted at the vertical joints. In every fourth longitudinal joint, a ¼-in. dia. pencil reinforcing rod was installed, the anchors being attached to this rod.

To overcome the temporary "blindness" of drivers suddenly entering the relative darkness of the tubes from bright sunlight, strong floodlights were placed under a white roof lining for 200 ft. at each entrance. The lining consists of a thin steel plate with the exposed face white enamel and the back a ¾-in. thick concrete mortar. The lining was delivered in 2x3-ft. sections made to match the curvature of the tunnel, the short dimension being placed horizontal. The sections were supported by 2-in. wrought iron clips and ⅜-in. dia. non-corrosive bolts and rawl anchors as illustrated by Fig. 6. This drawing also illustrates the stainless steel connections between sections and that between the tile and enameled steel linings. The floodlighting consists of three transverse rows of ten 1,000-w.

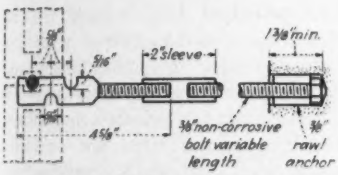
Fig. 4. Under drainage in the southbound tube was installed by trenching through the old pavement, which was left in place and capped by a new 5-in. slab.



Section Through Support for Tile Wall



Elevation of Tile Wall Support



Anchor Bolt for Tile Wall

Fig. 5. The tile along the sidewalls is supported by a continuous angle bolted to the concrete wall as shown. On 4-ft. centers vertcally and 5-ft. the other way, the tile is tied to the concrete with non-corrosive anchors.

overhead lamps. The rows are on 50-ft. centers, and the light beams are thrown forward in the direction of travel. These lights are for daytime use when the outdoor pavement illumination is 200 foot-candles or more. The rows are individually operated.

Other lighting improvements include: (1) Replacement of the old lights with 10-,000-lumen sodium-vapor units; (2) installation in each tube of two neon signs reading "Do Not Cross Center Line"; and (3) addition of incandescent warning signs at the sides of the tunnels. The original lighting system consisted of reflector-shielded, 2,500-lumen overhead incandescent fixtures suspended at the center of the arch on 50-ft. centers. They provided one-half foot-candle at roadway level.

The new 10,000-lumen sodium-vapor lights, which were designed especially for the tunnel by the manufacturers, are on the same spacing, but they increase the intensity at floor level to two foot-candles. The two signs warning motorists not to cross the center line in each tube are suspended from the ceiling. In addition, there are eleven lights focused on the black and white signs indicating the cross passages between the tunnels.

Power for all lighting is from two independent loops of the local power company. These supplies are stepped down in voltage at the fanhouse for the tunnel, where capacitators are provided to correct for the low power factor of the sodium-vapor lamps. The electrical load for both tunnels in watts is about as follows:

Sodium luminaires	60,435
Sign lights	3,300
Floodlights	60,000
Transformers	400
Misc. (Incl. crossover lights)	550
Total	124,685

During construction inside the tunnel, it was discovered that a small wire extending from the outside through the tunnel would permit radio reception in automobiles traveling through the tubes. Since motorists had often complained of interference with reception while passing through the tunnels, a small copper antenna was suspended from the luminaires. These wires are connected through the ventilating shaft to an antenna at the fanhouse on Mt. Washington 200 ft. above the midpoint of the tubes.

Another interesting feature of the improvements was modernization of the carbon monoxide recorders. Air samples are obtained 75 ft. from each entrance, at the middle, and near the end of each tube. The recorders are installed in the fanhouse and make a continuous graphic record of the parts of carbon monoxide per 10,000 parts of air. In addition they light warning signals and sound buzzers if the concentration becomes great. Their operation is as follows:

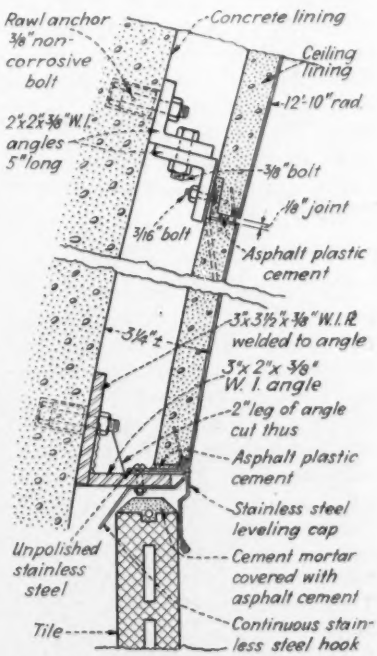
Parts CO per 10,000	Color of Warning Light	Buzzer Signal
0	no light	silent
0 to 3.5	green	silent
3.5 to 4.5	amber	silent
4.5 to 6.0	amber	sounds
6.0 and above	red	sounds

Construction at the approaches consisted of new paving, installation of new drainage facilities and elimination of traffic circle at North portal.

Directing personnel

Responsibility for the operation of the Liberty Tunnels is vested in the three commissioners of Allegheny County, John J. Kane, chairman; Geo. Rankin, Jr., and John S. Herron. Under the authority of the commissioners, the modernization of the Liberty Tunnels was planned and supervised by the Department of Works of Allegheny County, John F. Laboon, director; Levi Bird Duff, chief engineer; Charles F. Houlihan, assistant chief engineer in bureau of design; F. C. Coder, assistant chief engineer in charge of construction, and E. G. Messner, resident engineer. S. M. Madancy, road design engineer, was responsible for the pavement design, and S. A. Shubin, bridge design engineer, supervised design of the new lining.

The Mellon-Stuart Co. did the lining work; George Vang, Inc. held the paving and drainage contract, and the Morris Engineering Co. did the electrical work. Contract cost of the improvements was $858,662.



Connection Between Tile Wall and Ceiling Lining

Fig. 6. Support of the enameled steel ceiling at the entrances is by non-corrosive anchors embedded in the existing concrete lining.

ENGINEERING ABROAD AS SEEN BY ENR EDITORS

The Derry Navy Base in North Ireland

Waldo G. Bowman
Editor, Engineering News-Record
(By air mail from the European Theatre of Operations)

(LONDONDERRY, NORTH IRELAND)—A naval base is never finished. That's why, two years after construction began on the United States Naval Operating Base at Londonderry on Lough Foyle in Northern Ireland and 18 months after it began functioning as a key service station for convoy escort vessels of the American, Canadian and British navies, fair sized construction operations are still under way. That's why, too, there are almost as many Seabees here as there are other types of Navy personnel. In one sense, it explains the reason this particular Construction Communique is being written, although the construction story of the Derry Base is not one that can be told wholly in the present tense. There is a past that should also be recalled.

Built by American firms

Back in the early days, one of the great hush-hush construction operations of our war effort was this same Derry Base. Hundreds, perhaps several thousands, of persons, connected in one way or another with the construction industry, knew about it nevertheless. They knew that the Merritt, Chapman & Scott and George A. Fuller combination, which was building the Quonset naval air station in Rhode Island, was the contractor. They knew that the materials for it, every nut, bolt, pile and can of paint, were being shipped from Quonset, and that skilled American workmen formed the nucleus of the construction personnel. They knew even that American construction equipment was riding through North Atlantic gales to carry out a job on foreign soil. But there was very little talk, even along the construction grapevine, despite a feeling that the Germans had a better set of progress pictures on the work than the contractor. Even when the existence of the base was officially admitted in July a year ago, not much was said about its construction, an oversight which this dispatch seeks to remedy, however sketchily.

A construction achievement

From the dates that mark the historical mileposts in the work, it is apparent that the officers of the Navy's Civil Engineer Corps (headed at different times by Captains K. B. Bragg, Henry P. Needham and Harry A. Bolles) and the men of the T. A. F. (Technical Auxiliary Force, as the contractor was mysteriously called) chalked up a major construction achievement in the hectic days immediately before Pearl Harbor. For example, when Contract Noy-4850 was signed it included not only the Derry Base but other installations in Ireland. Within seven months after the first T. A. F. men arrived in Londonderry, the base was commissioned and ready to start operations on a scale exceeding peak activities attained at either the Queenstown (Cobh) or Lough Swilly bases of the last war. Then we used British bases. This time we built our own.

At the height of the work, T. A. F. had 800 Americans and 3,000 Irish workmen on its payroll. It built docks, warehouses and machine shops, a hospital, camps and an administration center. It started a fuel depot, and it fought mud, rain and the swampy banks of the River Foyle, often waiting in vain for materials and equipment that never arrived. One entire shipload of supplies fell victim to the U-boats, and other boats were lost that were bringing lesser but just as vital amounts of construction cargo. Work went on through all of 1942, and eventually replacement materials and equipment did arrive, as the busy machine shops and crowded dockside of today make clear.

Structures at Londonderry are of two principal kinds: steel column and truss framing covered with corrugated steel siding and Quonset huts. The huts are used not only for living quarters, but for hospitals and offices, the long span frames not only for warehouses and shops, but for the theatre and recreation buildings as well. These could naturally be thrown up quickly, but the problems of foundations and drainage in a country that has as many rainy days as North Ireland were not so easy. Details of construction procedure and special problems are unfortunately lacking, as the T. A. F. checked out last March, but they left behind them an example of rush wartime construction that will be the talk of Northern Ireland for years to come. As one sailor remarked, "They were hell-raisers when they weren't working, but they worked the same way that they played." Obviously, just a normal American construction gang.

The Seabees take over

Present construction at Londonderry is a Seabee operation, which has been gathering momentum since last December. Fresh out of training at Camps Allen and Bradford, proud of their outfit and all set to win

the war, the Seabees dropped straight into an Irish winter and an assignment that every construction man hates—finishing up the tag ends of a job. "Ain't we the suckers," said a C. P. O. "We enlist under a slogan 'we defend what we build', and we ends up a bunch of street cleaners." But the C. P. O. was wrong. He hadn't been in the Navy long enough to know that a naval base is never finished, that there is always costruction to be done.

A real construction task

And so the story of the Seabees at Londonderry is not that of a "white wing" squad, but of a real construction contingent—building, improvising, extending—and of a military outfit whose constant drilling and practice with weapons has made them second only to the Marines as defenders of a vital advanced base. They completed a tank farm and assembled a boiler plant. They built pumphouses, Quonset huts and a wharf. They constructed the foundations for a 20-ton stiffleg derrick, which they then assembeled and put in running order. They nursed a wornout pile-driver along until it literally fell apart as the last pile was driven. They built roads, and devised and operated an inter-camp bus system that saves gasoline and time. And they set up a maintenance shop that can make or rebuild anything that a Public Works Officer can think of.

Not like Texas

They even took a side trip to complete an 11-mile pipeline through rough and rocky country in which no self-respecting Texas or Oklahoma pipeliner would allow himself to be caught dead. Capt. G. A. Duncan, C. E. C., U. S. Navy, Public Works Officer on the staff of Admiral H. R. Stark, U. S. Navy Commander, U. S. Naval Forces in Europe, pays particular compliments to the Seabees for this pipeline job and for the tank farm work in Ireland. The Seabees in this theatre are doing all right for themselves.

That tank farm, for example, was no cinch. It involved welding a considerable number of 55,000-bbl. tanks, and the Seabees had trained back in Norfolk on one of 10,000-bbl. size that was bolted. It involved enclosing each tank in a brick wall, as protection against bomb fragments, and they hadn't had any bricklaying training at all. But the experience record cards, which the commanding officer had so religiously kept up to date on each man, yielded a few welders and a bricklayer or two. With these as a nucleus, other men were trained, aided by several local bricklayers who were rounded up without too much difficulty, this being Ireland.

The boiler plant job is better described as a jig-saw puzzle for which no amount of training would have done any good. Someone in the States decided that an assembled boiler took up too much room aboard ship, so these were shipped in pieces. And the pieces included every pipe, fitting and breeching part. As one of the Seabee officers remarked, "If your young son ever took the alarm clock apart and scattered the gears, springs and pinions all over the backyard, you have a good idea of what we found in the vicinity of these boiler plants." The boilers were finally assembled and made to work, but the mentality of the Seabees who did the job has hardly yet returned to normal, even including that of one man whose exceptional contribution to the success of the operation won him a recommendation for promotion to ensign. Needless to say, an urgent request was dispatched to headquarters to send no more boilers unless they were all ready to fire up on arrival.

Hut layout improved

Building the Quonset huts was a task more nearly in keeping with Seabee dignity. A couple of the installations are still exhibited with pride. One of these involves six living huts and a lavatory hut, the latter known as a "head" in navy parlance, but called an ablution house by the British and just a plain wash hut and latrine by our down-to-the-earth army. Previously such huts would have been laid out in a straight line, with the "head" flanked by living huts. The Seabee general staff decided this could be improved upon, and devised a rosette layout, three huts radiating from each end of the head, which was placed in the cent-

British Information Services

British sailors welcome American sailors arriving to take over the Londonderry base.

ter and divided into halves in which identical shower, wash room and water-closet facilities were installed. Covered walkways connect the huts to the head. No one has to go out in the rain, and it's only ten steps to whatever "head" service you require.

A new idea in postoffices

The second hut layout of note is the postoffice, built of two Quonset huts placed side by side, the intersecting arches resting on a longitudinal line of beams supported on a row of columns. The two 16-ft. span huts thus provide a 32-ft. wide room. Longitudinal spans between columns can be varied in length to fit partition needs by using different depth beams. A postal inspector from New York, now a lieutenant j.g., said branch post officers back home could do worse than to copy it. The Seabees allowed this praise to go to their heads and enclosed the steel pipe columns in wood, which they stained a rich English oak color. Despite all this design efficiency and special furbishing, however, there was no indication that mail was arriving any more speedily than it had been previously.

Difficult wharf building

One of the principal jobs that has occupied the Seabees recently is a new E-shaped wharf, the three "legs" of the E being roadways to and from the shore. It looks trim and shipshape on the drawings, but it didn't work out quite that way. The chief difficulty was with the piling, which consisted of the discards from all of the many past cargoes from the States. It is maintained that no more crooked piling was over exported. No one, including the wharf building gang, knows exactly how they got the 60-ft. lengths down, and least of all how they attached the bracing to the lines of piles that are not in alignment, but the job is finished and carries a 10-ton crawler crane without a quiver.

After the wharf was all laid out it was decided that it should carry a 20-ton stiffleg derrick. This introduced further difficulties, which were solved by driving separate piles through the deck to support the concrete foundations for the mast, and building foundations on the shore to carry the backlegs. Actually these backleg foundations are "on shore" only at low tide. At high tide they are 90 percent under water, which greatly reduces their effectiveness as anchors. Accordingly, to counter the effect of buoyancy, the foundation blocks had to be increased in size until they resemble huge monuments.

Their trigger fingers itch

Large jobs like these, however, are becoming less frequent at Londonderry. The Seabees are getting apprehensive lest this is one naval base that will actually be finished. They welcome work because it means promotions, 40 percent of the personnel having been raised in rank since they came overseas. But now they are building less and practicing more with rifles and machine guns. The result is itchy feet and itchy trigger fingers. Where do we go from here and how soon? The Seabees at Londonderry want to know.

Effect of Curing Compounds On the Quality of Concrete

Field and laboratory work by the U. S. Engineers would indicate that the use of different curing methods may have little effect on the relative quality of 3½-year old concrete exposed in a temperate climate. The studies were carried out under the direction of Bartlett G. Long and H. K. Kurtz of the Cincinnati Testing Laboratory of the U. S. Engineers at Mariemont, Ohio. In a joint paper presented at the recent annual meeting of the American Society for Testing Materials the two men described tests with six compounds of widely different properties; with water curing, and no curing. Two of the compounds were of the wax-base type, two of the resin-base group, and one was a coal tar product.

Modulus of elasticity measured

Dynamic modulus - of - elasticity measurements obtained with 4x4x16-in. concrete prisms in the laboratory were compared with the results obtained in testing 5-ft. square panels of a 3½-year old wall cured with the same compounds. The wall, which measured 6x85x1½ ft., was divided into 17 separate panels by metal "bulkheads" placed vertically at 5-ft. intervals. It was built by hired labor and extreme care was exercised to insure uniformity in all the panels. The concrete mix used for the laboratory specimens and the wall was virtually the same.

After 18 hr. of "fog-room" curing the laboratory specimens were removed from the molds. To some of the specimens curing compounds were applied with an air-brush at the rate of one gallon per 200 sq.ft. Some of this latter group, plus a number of specimens received no curing compound, were stored in a room of 75-deg. F. temperature and 50-percent relative humidity for 17 days and then subjected to freezing and thawing.

Other specimens were "fog-cured" for 17 days and tested. A third group were "fog-cured" for 14 days and stored in dry air for 3 days before being subjected to the freezing and thawing test. This test consisted of freezing in air at minus 50 deg. F. for four hours, and then thawing in water at 40 deg. F. for a period of two hours.

Dynamic E values of the laboratory specimens were determined by the common method of flexural vibrating frequency. These tests were discontinued when the dynamic E had been reduced to approximately 50 percent of the original 17-day value.

The wall tests were made by measuring the velocity of vibration transmission through the 18-in. thickness of the wall. Measurements were obtained for each wall panel, while the panel was vibrated on the vertical surfaces at a central point about 1.5 ft. from the top. The "pick-up" of the testing equipment was placed directly opposite the "driver" of the instrument on the other face of the wall. Values of E, comparable with those of the laboratory specimens, were thus obtained.

In general, the data obtained indicate that:

1. The effect of different initial curing methods on the relative quality of 3½-year old wall panels exposed to the climate at Huntington, W. Va., is slight.

2. The relative amounts of visible cracking or checking of the wall panels do not appear to be related to the method of initial curing.

3. A 3-day drying period, following 14 days of moist-curing, significantly increased the resistance of laboratory specimens to freezing and thawing.

4. The moisture content of the laboratory specimens, throughout the curing period and subsequent freezing and thawing, conditioned their behavior to a marked degree. The continued absorption of moisture after casting, apparently contributed to the reduced resistance of the specimens to freezing and thawing under the controlled conditions.

5. Relative effectiveness of different curing compounds may be more clearly differentiated by dynamic E determinations during the freezing and thawing of laboratory specimens, than when such determinations are made throughout the curing period only.

Liquid Asphalt Ends Pumping Action At Joints in Concrete Road Slabs

Maintenance engineers of the Ohio State Highway Department are using liquid asphalt injected under pressure below existing concrete highway pavements to eliminate "pumping action" at the cracks and joints. Although used but a short time, the method has proven effective and inexpensive. The treatment requires few workmen and little equipment.

The plan followed is to drill two holes in the slab near the joint, blow out the water under the pavement with compressed air, and fill the void below the slab with liquid asphaltic cement under pressure. The asphalt in a short time solidifies and provides a good support to the joint. While not suitable for an old, shattered pavement, the treatment eliminates excessive cracking at the joints where slabs are still in good condition.

Fig. 1. Pumping joints in road pavements are eliminated by injection of asphaltic cement at a pressure of 40 psi. through holes in the slab near the joint. Before adding the material, the pavement near the holes is sprinkled with a saturated calcium chloride solution to prevent the asphalt from sticking to the pavement if it oozes from the holes. Soft wood plugs are used to fill the holes after work ends.

Two crews do work

Two crews do the work, one of two men and one of four men. In the first operation one worker of the two-man crew drills two 1½-in. dia. holes in the slab with a jack hammer supplied with air by a 125-cfm. portable compresser. One hole is cut in each lane on opposite sides of the joint; the best location of the holes has proven to be about 15 in. from the center line and the transverse joint. After a hole is cut, the second worker, using air at 75 psi., blows out the water and mud below the joint or crack, working at one hole at a time.

After the mud and water have been blown out, the first crew moves on, and the other gang takes over to inject the asphalt. Supplied by an ordinary bituminous distributor at a temperature of 275 to 310 deg. F., the asphalt is injected at 40 to 60 psi. Experiments with asphalts of 25 to 100 penetration have shown that of 50 penetration to be most satisfactory.

Fig. 2. Equipment needed for the asphalt injection includes a tapered wood plug fitted around the 1-in. dia. pipe at the end of the distributor hose, a driving cap to protect the top of the pipe, and an extraction tool of the type shown.

The only special equipment required in this work is that shown in Fig. 2.

Asphalt is pumped under the slab until it begins to appear at the outer edge of the slab, a small hole having been dug beside the pavement to expose the edge of the pavement at the joint.

The average joint across a 24-ft. roadway requires about 25 gal. of material and some joints 45 gal. Sections of the pavement removed after a joint has been treated showed that the asphalt had formed a pad of about 1½ in. thickness under the joint, the pad extending outward to either side in a diminishing thickness for as much as 6 ft.

Traffic soon permitted

To add too much asphalt and raise the slab is possible, but in a few hours the workmen learn the proper technique. After the required amount of asphalt has been added, the holes are filled with plugs of soft wood. The slab is opened at once to traffic, as in a few minutes the asphalt has sufficient viscosity to keep it from being forced from beneath the pavement by a heavy load passing over the joint.

The common practice is to work on four or five joints at once, the time required for each joint being short. The work can be done at any time except when the soil and water below the slab are frozen. To date, 1,500 joints or transverse cracks have been treated by the Ohio department, the average cost being about $5 per 24-ft. joint. The treatment was started in the summer of 1942; at the end of the past severe winter the joints treated showed no sign of "pumping".

For the Ohio State Highway Department, Hal G. Sours is director and H. D. Metcalf, chief engineer of the maintenance bureau. S. O. Linzell, assistant engineer in the maintenance section, and C. B. Cuninghame, assistant division engineer, directed the field operations for the department.

Rigid-Frame Concrete Industrial Plant

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***Contents in Brief**—Concrete rigid frames of 100-ft. span prove economical in a magnesium-alloying war plant. Absolute fireproofing is secured throughout the manufacturing building by eliminating all windows, while an elaborate ventilating system disposes of the intense heat and strong gases generated during the manufacturing processes. Hollow, precast concrete roof slabs permit speedy erection during cold weather and effect considerable saving in form lumber.*

MANY PROBLEMS that challenge the skill and ingenuity of the designing engineer are presented by the functional requirements of an industrial plant even in peacetime, and, in wartime, these problems are greatly increased with the shortages of material, labor and the imperative need for speed in construction. This challenge is being successfully met in the current construction of a building containing several unusual features, forming one unit of a large midwestern war plant.

Equipment layout prepared first

First, an equipment layout was prepared based on a careful study of the requirements of the manufacturing process, which is the alloying of pure magnesium with other metals and the casting of the resulting alloy into pigs. Because of the highly technical manufacturing process, the efficient operation of the equipment was paramount. Upon completion of the equipment layout it was evident that the building should be approximately 100x360 ft. with a full basement and a manufacturing area 100x320 ft., free of columns and with a clear height of about 30 ft. at the center. The remaining 100x40-ft. area contains a 2-story building, which includes a general plant laboratory, store room, toilets, lockers, lunch and shower rooms.

The nature of the manufacturing process demanded an absolute fireproof building with windows omitted in the manufacturing area. Experience with the housing of similar

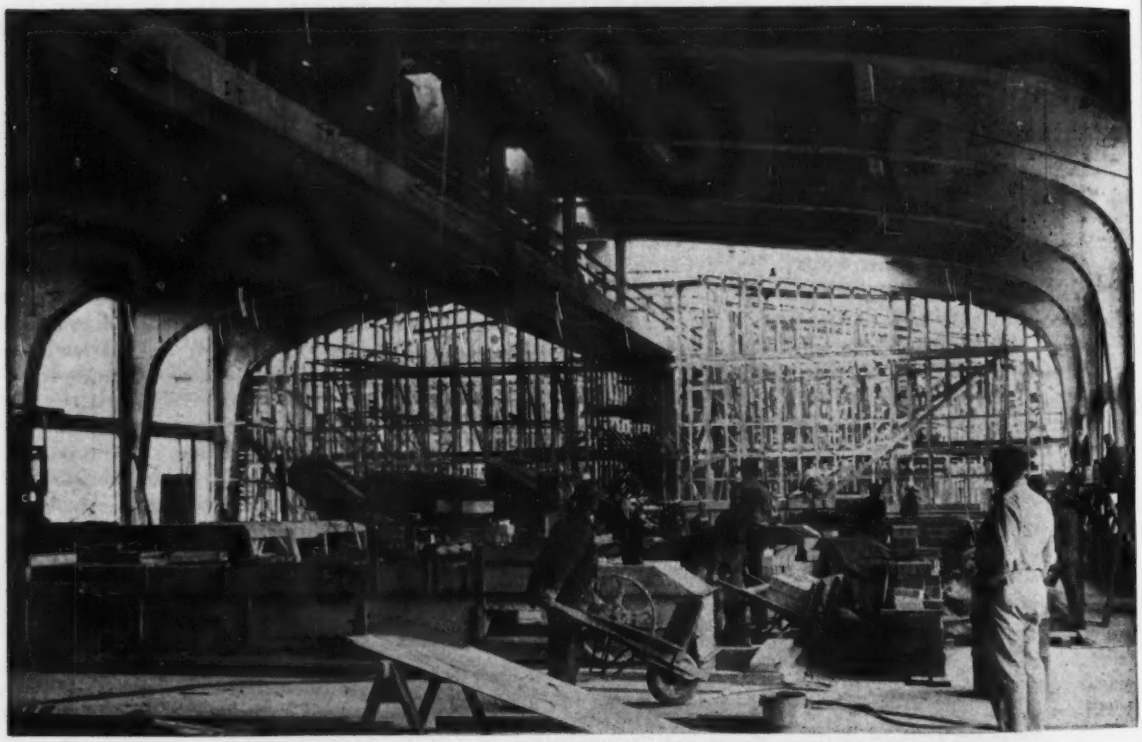


Fig. 1. Maximum unobstructed floor space is provided in a midwestern war plant by supporting the roof on 100-ft. span concrete rigid-frames. A concrete catwalk suspended from frames at center of building will support ventilating fans to exhaust excessive heat and gases, collected from operating equipment, up circular stacks extending through the catwalk and out through a continuous ridge-ventilator.

equipment also disclosed that exposed or unprotected steel construction would be severely attacked by the gases given off in the process while concrete would not be affected materially.

Three types of construction considered

Since economy was also a factor, estimates were prepared on three types of construction: (a) steel trusses and columns protected by metal lath and cement plaster, columns brick encased, and with precast concrete roof slabs; (b) steel rigid frames, protected with metal lath and plaster and with precast roof slabs; (c) concrete rigid frames with precast concrete roof slabs.

In these investigations 20-ft. bays were specified with a precast concrete roof spanning the entire distance to avoid the use of purlins which would have been difficult to fireproof.

Case (c) proved to be most economical and met all the requirements, being fireproof, unaffected by gases, contained a minimum of critical materials, provided speedy erection, and since only form lumber, concrete and steel reinforcing was to be used, promised less chance of delay due to material deliveries.

Architectural appearance

A preliminary design indicated that the frame legs at the floor line should be approximately 2x3½ ft. The projection of the legs on the inside being objectionable from an operational standpoint, the 8-in. brick wall was set 2 in. back of the inside of the leg at the floor line with the legs forming pilasters on the outside. This it was found, added to the architectural appearance of the building by breaking up the long expanse of windowless walls. This feature was further enhanced by the addition of 1½-ft. concrete wing walls on each side of the frames. The pilaster effect was carried to grade line with the top of the pilasters terminating under a concrete cornice running the entire length of the building. This cornice functioned as a strut at the top of the frame legs and also furnished a solid shoulder to receive the precast roof slabs. Dark red brick panels framed by the cornice, the foundation wall and the wing wall complete the exterior facades.

The first floor is supported by stub columns spaced 20-ft. c. to c. with

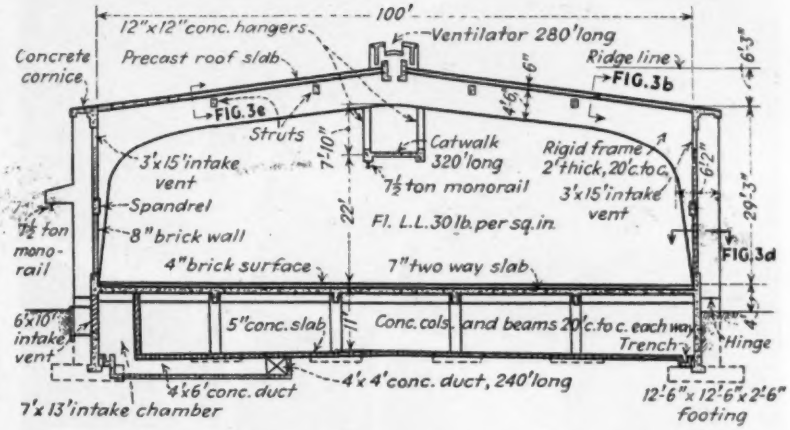


Fig. 2. In the manufacturing building positive fireproofing is insured by omitting the windows and using concrete and brick throughout. Fresh air is inducted through a vent at grade line and distributed through a concrete duct under the basement floor, thence by blowers to the manufacturing equipment.

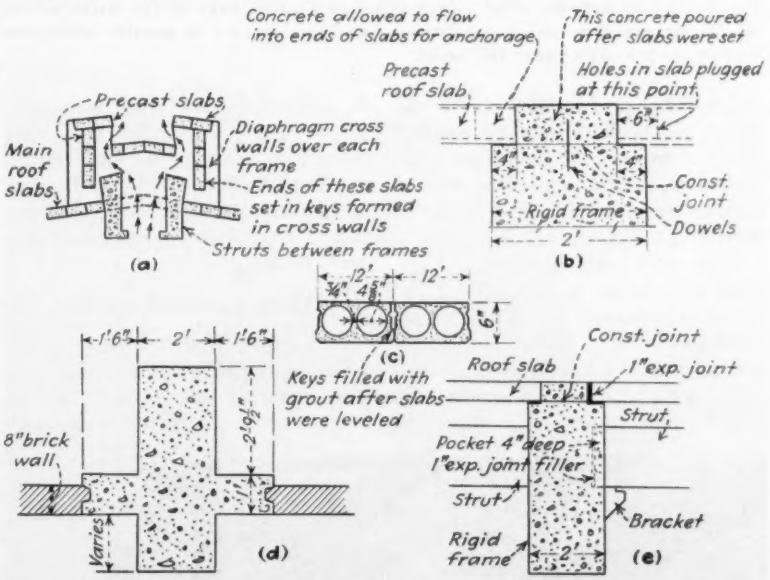


Fig. 3. Many interesting features of concrete construction are contained in the details of the building. (a) a gravity type continuous ridge ventilator extends 280 ft. along the roof, (b) roof slabs are securely anchored to concrete frames by plugging holes in hollow slabs before making final top pour of frames, (c) keyways formed in roof slabs are finally grouted to give a splined effect, (d) brick sidewalls are securely keyed to wing walls on concrete frames and (e) expansion is provided at the third-points by inserting roof struts in 4-in. deep pockets and providing one-inch thick expansion material.

beams running both ways and supporting a 7-in. two-way reinforced concrete slab. One factor leading to this choice of slab was the numerous openings required in the slab for equipment. Over the slab was laid a 4-in. paving brick wearing surface. The basement, used primarily for storage, is floored with a 5-in. concrete slab laid on grade and pitched toward trenches along the side walls. Access is provided by a ramp from the outside and by stairs and a freight elevator from the first floor. The two bays used for laboratory, locker, lunch and shower rooms, and the end bents are framed in the conventional manner with columns extending up to the roof.

To speed construction by eliminating formwork and make possible erection in the severe winter weather, roof slabs were precast hollow—using the Flexicore system in which a

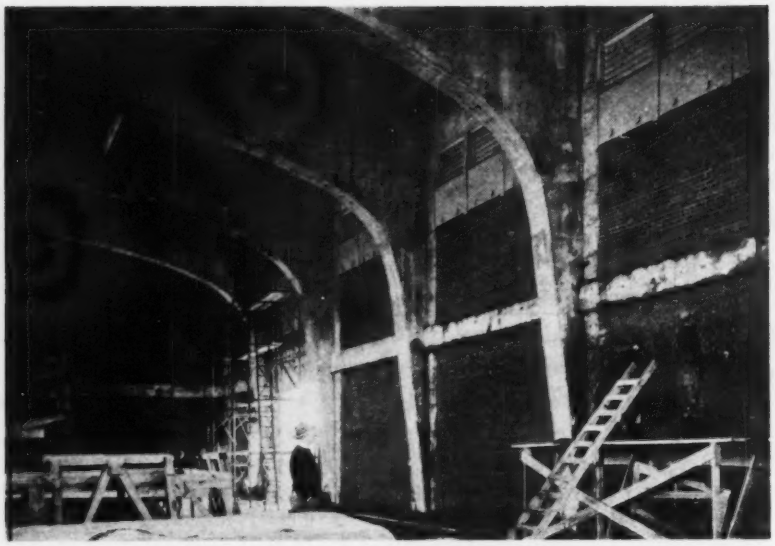


Fig. 4. Windowless construction insures positive control of ventilation. The 8-in. brick wall between rigid frames is set two inches back of the inside of the leg to improve operational conditions. Adjustable louvers to provide additional outside air are shown near the eaves.

controlled-shaped inflated core is deflated and withdrawn after casting. These slabs span 20 ft. between the frames and they were cast with a camber equal to the dead load deflection to eliminate any sag.

This type roof deck eliminated the need for purlins or beams and resulted in an appreciable dead load reduction over a cast-in-place slab since the 6-in. thickness weighs only 38 lb. per sq.ft. Roof slabs were cast with a small groove or grouting key in each slab and after they were placed and leveled, the keys were filled with grout giving somewhat of a splined effect and holding the deck in perfect alignment. Over this surface a 5-ply built-up asphalt roofing was applied.

Ample ventilation provided

The intense heat and strong gases given off in the manufacturing processes required some positive system of ventilation. Fresh air is inducted through a vent at the grade line and distributed by a concrete duct under the basement floor. This air is tempered during extremely cold weather with steam coils in an air intake chamber. The air is taken from this concrete duct by blowers mounted in the basement over the duct and distributed in sheet metal ducts to the base of the equipment giving off the most heat and gases. Sheet metal hoods were constructed over such equipment with circular stacks passing up through the roof. To provide a more positive draft in these stacks large fans were installed above the hoods. Approximately twice as much air is exhausted by the fans and the continuous ridge ventilator as is introduced at the base of the equipment by the blowers in the basement. The remainder is taken in through a series of ventilators near the eave line. Provision was made for closing part or all of these ventilators should operating conditions make this desirable.

Providing a platform to support the fans that were installed in the ducts above the equipment hoods presented a difficult problem. All of the equipment requiring ventilation is near the center of the building and since any columns extending above the first floor would have been very objectionable, it was decided to suspend a concrete catwalk or platform 10 ft. wide from the rigid frames. This platform is located 22 ft. above

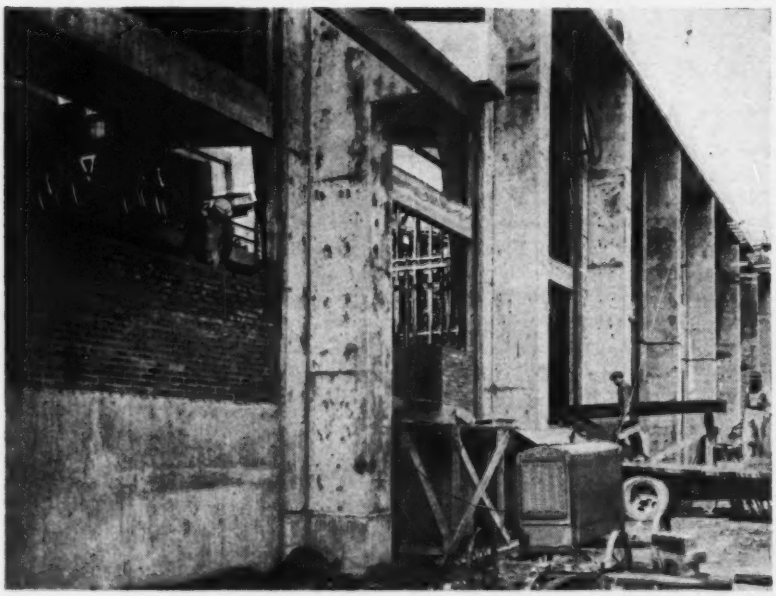


Fig. 5. Rigid frame legs, 2x3½-ft., with 1½-ft. concrete wings on each side form pilasters that are topped by a concrete cornice, which serves as a strut and also provides a firm shoulder to receive precast roof slabs.

Fig. 6. To provide a hinge at the first floor for the rigid frames, reinforcing steel is crossed at the joint and fillers of expansion joint material are inserted over the outer one-third of the bearing between pier and frame leg. Outside steel has not yet been placed.

the first floor or 7 ft. 10 in. below the underside of the frame at the crown.

The two 12-in. square concrete hangers spaced 9 ft. apart were suspended from each frame with heavy reinforcing to prevent cracking and to carry the load in tension. This catwalk extends 320 ft. in length, the ends being supported by concrete beams placed between columns of the framed bents. Access to the catwalk is provided by concrete stairs at each end to the first floor. A 7½-ton capacity monorail is attached to the underside of the catwalk with anchor bolts set in sleeves to make replacement possible if it should become necessary due to the action of the gases given off. This monorail will provide for efficient handling of hot metal between melting pots and the pig-casting machines.

Gravity type ridge-ventilator

Another very interesting feature of this building is the gravity type continuous ridge-ventilator extending 280 ft. along the ridge of the roof. While constructed entirely of concrete the cross section is similar to the ordinary ridge ventilator commonly built of steel. Knowing that the escaping gases would severely attack steel but not materially affect concrete and that a saving of steel would result, a detail was developed using precast slabs for both the side walls and roof. Diaphragms or cross-walls were cast in place over each frame with vertical keyways formed in them to receive the ends of the slabs forming the walls. These slabs were then lowered into position and the ends grouted. Slabs forming the roof were erected and grouted in the same manner as the main roof.

Foundation design

Foundation design presented an interesting, if not difficult problem. Soil samples indicated a thin layer of hard yellow clay, underlaid with a thick layer of medium blue clay with a very low shear value. Computations for soil bearing capacity indicated that the larger and deeper that the footing was made, the smaller the unit bearing capacity became. The allowable soil bearing value was finally set at 3,200 lb. per sq. ft. for individual footings with an overall capacity of 800 lb. per sq. ft. for the building.

With the building 360 ft. in length and subject to a wide variation in temperature, it was necessary to provide for expansion, and 1-in. thick joints were placed at about the third points. Instead of placing double bents at these joints, the struts connecting the frames were set in pockets 4-in. deep formed in the side of the frame with a small bracket under the strut. While the value of this member as a strut is problematical, it still retains its value as a beam carrying a corrugated asbestos curtain.

Original plans called for forming and pouring four bays at a time, thus permitting reuse of the forms. However, shortening the construction schedule, together with the length of time required to maintain the forms in place, made it necessary to form all frames at one time. All contact surfaces were formed with plywood ranging in thickness from ¼ to ⅝ in. The legs of the frames were formed by using wall-type forms with studs, wales, and wall ties, it being impossible to use column clamps due to the irregular shape of the legs and wing walls. The frame haunches were

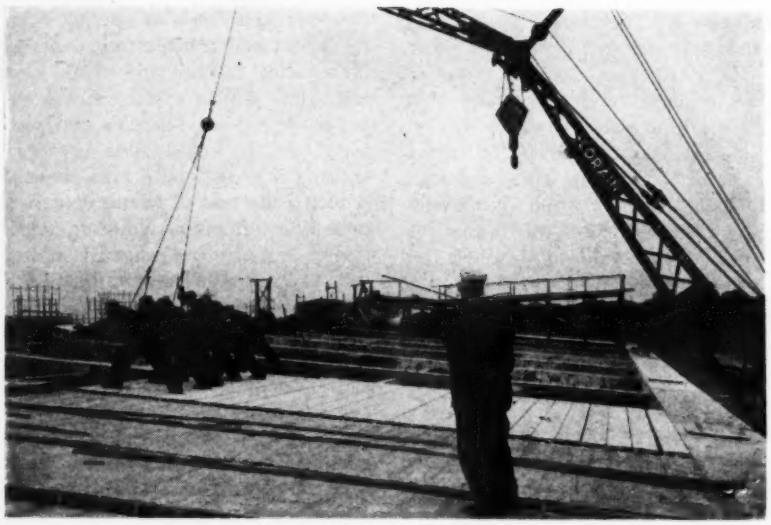


Fig. 7. Hollow precast concrete roof slabs, spanning 20 ft. between rigid frames, are placed directly in position by a crane with an 80-ft. boom and a 15-ft. jib.

Fig. 8. Cross-walls, cast in place atop the rigid frames, support sections of roof slab and vertical keyed walls that make up the building's continuous ridge ventilator.

formed with plywood, studs, wales and wall ties.

Of particular interest was the method used for shoring that portion of the arch directly above the catwalk. In order to keep the catwalk clear of all shoring, it was necessary to span the entire width of the walkway. A timber bent was placed just clear of the walkway framing and heavy wooden girders used to bridge the distance. Beam sides were stripped in fourteen days and the soffits in 21 days.

Placing concrete

All concrete below the first floor line was poured in the conventional manner in the following sequence: footings, walls, columns, beams and slabs.

The catwalk slab, beams and hangers were poured in advance of any pouring on the frames proper. A 1½-cu. yd. hopper was placed near the roof level, the concrete was hoisted in a bottom dump bucket, dumped into the hopper and deposited in the slabs and beams through chutes. Concrete hangers were poured before the frame reinforcement was placed.

Two methods of placing the roof slabs were considered. The first method called for the erection of the arch formwork and the setting of the roof slabs directly on the forms. The slabs could then be grouted in place and the deck used for construction activities, such as placing reinforcement and transporting concrete for pouring the ribs and struts. This method would have reduced the expense of building scaffolds and runways and it would have provided housing over the entire roof, thereby reducing the cost of winter construction to a minimum. However, additional bracing and shoring would have been required to carry the added deck load, which would have amounted to about 38 tons per bay. The second scheme employed the conventional method of pouring the ribs first and then placing and grouting the roof slabs. This method was adopted after it became apparent that winter conditions would not be a deciding factor.

All concrete placed before the roof slabs were erected was poured by a bottom dump bucket discharging into a hopper placed on the roof at the eaves, from which it was placed in the forms with concrete buggies. The legs of the frames were poured first and allowed to set so as to take their initial shrinkage, then the beam portion together with the struts and eaves were placed in continuous pours. The tops of the frames were screeded to a true surface to receive the roof slabs. Before placing the slabs the surfaces were tested with a straight edge and all bumps that would tend to cause the slabs to rock were eliminated. Roof slabs were then erected by a crane with an 80-ft. boom and 15-ft. jib and lowered directly in place without wheeling. The ends of the grouting keys were plugged with stiff mortar and then grouted with a mixture consisting of one part cement and three parts of sand. Surplus grout was removed with a squeegee. After the slabs were grouted in place the voids between the ends of the slabs, directly over the girders, were filled by plugging the slabs 6 in. from the end and filling with concrete. This concrete is anchored to the frames with hairpin dowels.

Compressive strength of concrete

Concrete of 2,500 psi. ultimate compressive strength was used in the footings and 3,000-psi. concrete was placed throughout the remainder of the structure. All concrete was thoroughly vibrated with internal vibrators. Reinforcing steel was designed for 24,000 psi. in accordance with the National Emergency Code for reinforced concrete in buildings.

The design and construction was done in record time by The Austin Company for one of the major chemical companies, acting for and on behalf of the Defense Plant Corporation. For The Austin Company, Frank Maynard was project manager, Wm. Brown, field superintendent and J. Carl Phillips, designing engineer.

Laboratory Studies on TNT Wastes

Because of the urgent need for a satisfactory, economical means of treating large quantities of TNT wastes, exploratory experiments on the effects of these wastes on sewage treatment devices and on possible chemical treatment were carried out at the U. S. Public Health Service Laboratory in Cincinnati. These were described by Stuart Schott and C. C. Ruchhoft, members of the staff at a recent meeting of the American Chemical Society, an abstract of which follows:

A typical analysis of the waste showed total solids of 1,700 ppm., total ash of 892 ppm., and only 29 ppm. of suspended solids. The acidity was 1,700 ppm. with 610 ppm. of sulfates and 27 ppm. of nitrate nitrogen. Although the oxygen consumed value (by dichromate) was 121 ppm. the waste showed practically no 5-day B.O.D. Extended B.O.D. incubation tests for a period of 129 days indicated very little biological breakdown and oxidation of this waste. The waste interferes with the ordinary Winkler procedure for dissolved oxygen, though the Rideal Stewart modification may be used on dilutions of the waste up to 4 to 8 percent.

Discharge of the sellite waste with a 1 to 1,000 dilution into streams which are used for public water supply would result in a color greater than that permitted by the U. S. Public Health Service drinking water standard and impart an enhanced taste to the water when the water is chlorinated. This was indicated by taste tests with individuals who were unaware of the source of the water.

Because the TNT isomers and their derivatives are largely in true solution, neutralization and filtration or treatment of this waste with chemical coagulants is practically ineffective. The quantities of activated carbon required to effectively remove the colored constituents prohibit this method of treatment. Chlorination of the waste results in color reduction.

Experiments in which neutralized TNT waste was added to sewage and treated by activated sludge indicated that 5 percent or more adversely affected the activated sludge process and that quantities up to almost 25 pecent might be tolerated by a sprinkling filter at normal summer temperatures when dosed at a rate of 1,000,000 gal. of sewage per acre per day.

ENGINEERING ABROAD AS SEEN BY ENR EDITORS

Building the Inter-American Highway

PART III—Construction in Costa Rica and Panama

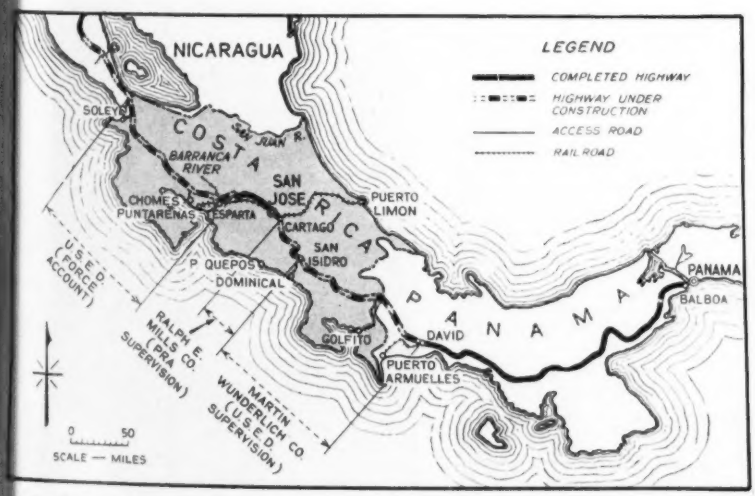
A. N. Carter
Assistant Editor, Engineering News-Record

● Surveying, access and housing along the Inter-American Highway were described in the July 29 issue of *Engineering News-Record* and construction operations in the four northern republics were reported in the August 12 number. In the following is a description of the construction methods followed in Panama and Costa Rica and a review of the service and repair methods employed in all six of the Central American countries to keep equipment operating.

In Costa Rica and Panama is located the most difficult construction along the Inter-American Highway. For over 150 miles no access trails to the route of the road were available, the highway climbs to an elevation of 10,900 ft. and penetrates mile after mile of the heaviest jungle in Central America. Heavy rock work is required for nearly fifty miles. In addition, rainfall may be as high as 300 in. yearly at some points along the route. Furthermore, the shipping lines to both countries are long and shipping space is limited, making delivery of supplies and equipment both slow and costly.

Only 61 miles of the 384-mile section of the road in Costa Rica has been completed when the present work was inaugurated. This portion is a macadam pavement built in the San Jose area about six years ago by the Costa Rican highway department. It is of limited capacity due to the bad curves and narrow roadway and bridges.

Beginning at the Nicaraguan-Costa Rican boundary the highway for the first 153 miles in northern Costa Rica is uncompleted. It runs across a mountainous country, much of it dense jungle, where no access roads were available. The road climbs as high as 4,000 ft. Grading for the 153-mile section is expected to total 2,755,000 cu.yd. River and stream crossings are numerous, 888 drainage structures of less than 20-ft. span and 123 bridges of larger size being required.



In Costa Rica 323 miles of new road must be built, including the most difficult construction along the highway. Work in Panama consists of 35 miles of new road and 13 miles of reconstruction.

Northern section by force account

The U. S. Engineers are constructing the 153-mile section in northern Costa Rica, except for the 321-ft. Barranca River Bridge being built by the Frederick Snare Corp. for PRA. Work on the highway was begun by a general contractor from the United States, but the Corps of Engineers later decided to complete this section by force account methods.

Construction activities of the U. S. Engineers are concentrated at two points, at about the middle of the 153-mile section and at the southern end. At the former location, nearly 2,000 men are at work on a 10-hr. shift. The equipment is operated by both Americans and Costa Ricans, and local common labor is used.

The rainy season now in progress in this area is expected to continue

More road-building equipment is used in southern Costa Rica than at any other point along the highway. These units are being used by Ralph E. Mills on a 71-mi. section where road climbs to El. 10,900 ft.

until December. Every afternoon heavy rains occur, making grading and surfacing operations both slow and expensive. Also, delivery of supplies and repairs to the job is difficult. Earth-moving equipment in use in this area include but 9 carrying scrapers, 7 patrol graders, 20 bulldozers, 5 shovels and 5 rooters. Thus, with excavation averaging 25,000 cu.yd. per mile, advancement has been far from rapid.

At the middle of the 153-mile section as of July 1, 25 miles of road had been graded, 12 miles had been surfaced with crushed stone, and about one-tenth of the drainage structures had been completed. Grading and surfacing operations are similar to those in Honduras and Nicaragua, described in *ENR*, Aug. 12, p. 273, as is construction of the larger bridges. However, the larger box culverts are much different.

Many of these drainage structures are being built of timber because of the lack of other materials. They are designed for a minimum life of 5 years. Side walls, bottom and roof are made of heavy planking nailed over a rigid timber frame. All of the timber is cut at local sawmills and can be made available much sooner and cheaper than other materials can be supplied.

Some hand labor used

At the south end of the 153-mile section, about 2,000 native workmen are doing the grading with wheelbarrows and hand tools aided by two or three bulldozers and a patrol grader.

Between November and August, the 2,000 workers using hand tools had completed 10 miles of grading requiring 30,000 cu.yd. of earthwork per mile. Because of the difficulty in getting repair parts for the two rock crushers on the job, application of the crushed stone has been slow. About 8 miles had been surfaced by July 1. In this area a road of 16-ft. overall width is built and surfacing is for the full width. Trucks operated

G. Haven Bishop photo

Lacking other materials, in Costa Rica the U. S. Engineers are constructing many timber culverts, as illustrated at the left. These structures are designed for a life of five years. On one short section culverts of type at right are being built of basalt crystals quarried nearby.

In southern Costa Rica the highway climbs to an elevation of 10,900 ft. and penetrates the heaviest jungle in Central America. Grading is extremely heavy, as this aerial view shows.

by native drivers deliver the stone from the crushers.

A type of culvert uncommon to the rest of the Inter-American Highway is being built on this section. It is made of irregular hexagonal basalt crystals of about 12 in. minimum transverse dimension and 2½ to 5 ft. in length. Culverts with openings 4 ft. 8 in. high and 2 ft. 6 in. wide have been constructed. The sidewalls are built by placing the crystals parallel to the center line of the road, and the roof is a single thickness of the stones covered by a minimum of 3 ft. of earth. Construction costs one-half as much as a timber culvert.

Over the Barranca River the Frederick Snare organization under PRA supervision is constructing a steel truss span with steel I-beam approaches. This structure, which was started early in June, requires no unusual construction.

All the work in northern Costa Rica originally was scheduled for completion early next year. Now it is realized that this assignment cannot be met unless more equipment can be obtained. Furthermore, repair parts are very limited, and as a result machines sometimes are "down" for long periods.

In southern Costa Rica is located the most difficult work on the Inter-American Highway. Remaining to be completed in this area is a 170-mile gap penetrating the heaviest jungle in all of Central America and climbing to an elevation of 10,900 ft. Access to this part of the road is very difficult because of the absence of trails.

PRA has difficult section

The Ralph E. Mills Co. of Roanoke, Va., under PRA supervision, is building 71 miles of the Inter-American Highway in southern Costa Rica and a 21-mile access road from Dominical on the Pacific Coast to the highway at San Isidro at the south end of the 71-mile section. Construction of the access road, which is through rugged jungle and required 650,000 cu.yd. of excavation, started in November and was completed in July, including surfacing with rock.

Access to the north end of the 71-mile job is by a paved highway from San Jose to Cartago. Materials and equipment to be delivered to this end of the project are shipped by water to Puntarenas, transported to San Jose over the 81-mile Pacific Railroad, and then trucked to the job.

Not only does the Ralph E. Mills work include four tunnels totaling 1,100 ft. and one mile requiring 750,000 cu.yd. of grading, but the total grading for the 71-mile project is estimated at 13,000,000 cu.yd., including nearly 50 percent of rock. Width of the finished roadway is 30 ft., which is in accordance with the original PRA plans. (Although requiring more work than a 16-ft. road of the type being constructed elsewhere, PRA engineers do not expect their project to be a bottleneck). Many 100-ft. fills are required, and cuts of 100 ft. are common, the deepest being 200 ft. on the center line.

The Mills organization consists of operators from the United States and 4,000 local common laborers. Crews of the Mills firm have been at work at the north end of the 71-mile section since November of last year. Earthmoving equipment in use at that point includes: 35 carrying scrapers, 132 tractors, 6 rooters, 8 patrol graders, 4 rock crushers, and

On PRA's 71-mi. section being built by the Ralph E. Mills Co. earthwork is by mechanical equipment, but much hand labor is used on shaping the shoulders. Surfacing will consist of 8 in. of stone and 2-in. bituminous wearing surface.

18 shovels varying in capacity from ¼ to 1½ yd. At the time of the writer's visit late in May, 15 miles was complete as 24-ft. macadam except for addition of the wearing surface. Excavation was completed on another 13 miles south of Cartago, and 20 additional miles was well advanced.

Unusually long rainy season

Ordinarily the heavy rains in this region end in December to be followed by three to four months of dry weather. However, this year the rains continued daily until February, and started again early in April. They are expected to continue until November.

Rain is not the only source of trouble; a major problem is the dense jungle itself. Trees of 8-ft. dia. above the butt and 120 ft. high are common. In one area the road penetrates oak timber running to 60,000 bd.ft. per acre, according to estimates made by the U. S. Forest Service technicians now stationed in Costa Rica. Through this densely forested area the right-of-way is being cut 150 ft. wide to make a drier road than would be possible with the narrower clearing made elsewhere.

The plan of the Mills organization is to complete a trail road along the entire section, and then to follow behind with the final grading. This plan will permit early access to the rock work, which is at about the middle of the project. Once the rock is accessible, excavation through the rock can be carried on despite the rains.

Construction of the trail road in itself is extremely hard going. First, a corduroy must be built, the logs being covered with about 2 ft. of waste material from the quarry areas, then, because one layer is not enough in the deep mud encountered, another layer of logs is added, and more surfacing applied. Since the surfacing must be hauled several miles by truck, this work is slow and costly.

The Public Roads Administration is having the Mills firm build permanent drainage structures. Because the road follows the Continental Divide for several miles, no large bridges will be needed. However, 770 culverts are required. The greater number of the waterways are small corrugated metal pipe; the larger structures are concrete boxes.

Temporarily, the 24-ft. roadway is to be surfaced with two layers of crushed stone rolled in place and totaling 8 in. After the many high fills have had a chance to settle and the bad spots have been eliminated, a 2-in. asphalt wearing surface will be added.

The entire PRA project, including addition of the wearing surface, is scheduled for completion in 1945.

Army engineers build 91 miles

South from San Isidro to the Panama border the highway in Costa Rica continues through dense, sparsely-populated jungle as a 16-ft. all-weather road surfaced with crushed stone. This work totals 91 miles and requires 670 drainage structures. Of the bridges required, nine are being built by the Frederick Snare Corp. for the PRA. Two of these crossings have been started and are to be completed late this year. One structure is a 102-ft. reinforced concrete girder over the north branch of the General River, and the other a 200-ft. steel truss span over the south branch of the same stream.

The grading, surfacing, and construction of the remaining drainage structures for the 91-mile section are being done by the Martin Wunderlich Co., Jefferson City, Mo., for the Corps of Engineers. This work was started from both ends, and as of July 1 about 1,600 men were employed. However, not much progress has been made at the north or San Isidro end, due to the fact that the delivery of equipment and materials to that end in quantities was impossible, except by air, until the 21-mi. access road from Dominical to San Isidro was well advanced. Hence, up until March, only three tractors were at work on this section. Drainage structures for the first 25 miles south of San Isidro are underway. Grading has only begun.

Work at the south end of the 91-mile section or in the extreme southern part of Costa Rica is somewhat less advanced. To get to the highway in that area, a railroad owned by the United Fruit Co., which starts at Golfito, Costa Rica, was extended for 9 miles. Much of the location was under water and rainfalls of 18 in. during a single day were not uncommon. As a result, the construction crews often had to work up to their waists in water to clear the right-of-way.

A construction procedure that proved successful was as follows: The ties were put on sleepers and floated into place. After a short length of rail had been spiked to the ties, cars loaded with ballast were backed onto the new track, the ballast dumped, and the cars pulled away. Next, the short length of track buried below the ballast was raised, and the procedure repeated ahead.

Because it was necessary to use this method of construction, three months was required to build this 9-mile railroad. From the end of the railroad, an access road 22 miles long surfaced with crushed pit-run gravel and volcanic ash is being constructed to connect with the Inter-American Highway at a point three miles from the Panamanian border. This work is just now being completed. Consequently, to start operations on the Inter-American Highway in this area, except for clearing and some bridge construction, was not feasible until recently. The 91-mile section is scheduled for completion by June.

PANAMA SECTION ALMOST COMPLETE

When completion of the Inter-American Highway was decided upon, 308 miles of existing road in Panama was included in the project as being serviceable and an additional 13 miles was scheduled for reconstruction. This left 55 miles of new road to be built. The serviceable portion starts at David, third largest city in Panama, and extends eastward to the Panama Canal Zone. For the most part, it is a rough, narrow road surfaced with crushed stone or macadam and includes 61 one-way bridges. The last 84 miles is a good 22-ft. concrete pavement completed a year ago under PRA supervision.

The uncompleted portion, between David and the Costa Rican border, cuts through rough jungle country similar to that in southern Costa Rica. The Panama work is being done by the Martin Wunderlich Co. for the Corps of Engineers.

As in Costa Rica, the past several months in western Panama have been abnormal as to weather. Ordinarily, no rain is received in this region late in the year, but during December, 1942, rain fell every day but one. Total rainfall last year at one site was over 300 in., and at another 250 in.

Delivery of equipment for the Panama work also has been difficult. Supplies and machinery had to be shipped to Puerto Armuelles, Panama, and moved from there by rail to David, or Concepcion. Not until December was the first equipment in operation, and at the time of the writer's visit that in use included: twelve carrying scrapers, twenty 105-hp. tractors with bulldozer and scraper attachments; fourteen 12-yd. end-dump trucks; one 3½-yd. shovel; two ¾-yd. shovels, and two rock crushers with a combined capacity of 125 cu. yd. daily. American operators are employed and the common labor is from Panama. Total employment in Panama by the Wunderlich firm was about 500 men at the end of June.

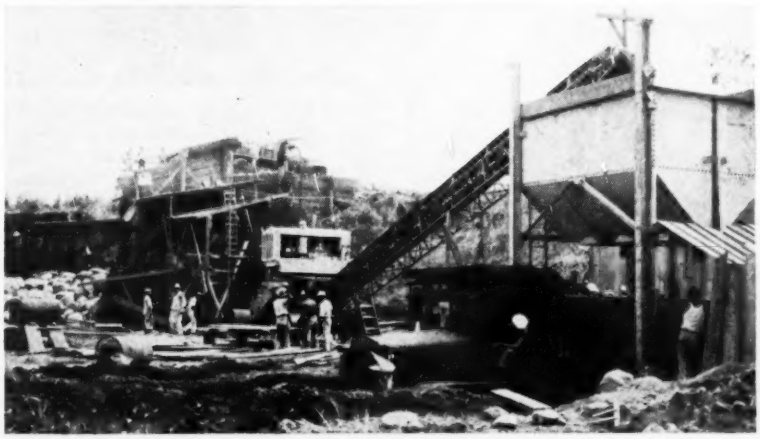
Despite bad weather, the lack of repair parts and transportation difficulties, as of July 1, 15 miles of the project has been completed, including surfacing. Grading is completed on 15 additional miles; and 5 miles more are well advanced. In addition, a trail road has been broken through to the Costa Rican border.

Progress during the next several months cannot be rapid if the normal amount of rainfall is received. Hence, completion of the work in Panama early next year, as scheduled, may be difficult. The grading and surfacing methods are similar to those in Costa Rica.

Across a narrow but swift stream in Panama the Martin Wunderlich Co. built this timber bridge, which has a 69-ft. span supported near the center by a heavy Y-timber brace resting on a boulder. Seven 30-in. dia. stringers were used.

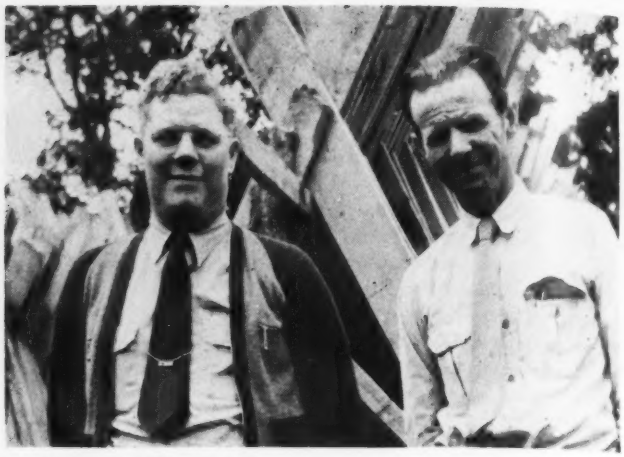
G. Haven Bishop photo

Timber bridges built of lumber sawn locally are used extensively in Panama.



Much of the crushed stone for surfacing in Panama is produced by this American-made plant consisting of a 15x35-in. primary jaw crusher and a 22x44-in. secondary roller crusher. Average production is 100 cu. yd. daily.

Key Men for American Contractors



Clinton H. Wood (left) is project manager and **John W. Ruth** superintendent on the 71-mi. Ralph E. Mills section in southern Costa Rica.

Don Daybell, general superintendent for Swinerton McClure-Vinnell, supervises construction on 175 miles of the road in Honduras and Nicaragua.

G. Haven Bishop photo

Martin Wunderlich (left), president, and **George Leonard**, project manager, are in charge for the Martin Wunderlich Co., which is building 146 miles of the highway in Costa Rica and Panama.

Wm. McCall, office manager for Swinerton-McClure-Vinnell, spends most of his time in Managua.

A. C. Kirkland, assistant superintendent for Swinerton-McClure-Vinnell, has his office at Managua.

Thomas J. Burke, project manager for the Frederick Snare Corp., is supervising construction of about 20 bridges.

R. E. Edmonds, bridge superintendent for Frederick Snare Corp., in Costa Rica, works in dense jungle.

At Dominical, Costa Rica, extensive repair facilities have been established by the Ralph E. Mills Co., which has some of the best repair shops in Central America. Until a 21-mile access road was completed at a cost of over $800,000, travel from Dominical to the highway at San Isidro was extremely difficult.

MAINTENANCE AND REPAIR OF EQUIPMENT

A major problem in building the Inter-American Highway is that of servicing and repairing the equipment used on the work. Because of the difficult transportation problem in getting equipment to the job, an effort is made to have every unit operated the maximum possible number of hours. Adherence to such a program has been found difficult due to the following reasons: Repair parts are just as difficult to get as is the equipment itself; breakdowns are frequent due to the heavy work and the inexperience of many native operators; repair shops are almost unknown in much of the region through which the road runs, making it necessary to set up shops at the camps; mechanics to make repairs are scarce, as are local materials with which repairs can be made.

In Guatemala, where a large part of the construction is by hand labor, disabled equipment is not as serious a problem as in the countries where more equipment is used. Repair shops for hand tools and light machine work have been set up at the principal camps, and a shop for major repairs has been established in Guatemala City. Equipment that cannot be repaired at the local shops is sent on flat-bed trucks to Guatemala City.

When the El Salvador highway department was engaged to carry out the work in that country, the department employed a number of skilled operators familiar with the use and servicing of road building equipment. Because of this and the fact that much of the work is being done with hand tools, long delays in El Salvador due to the breakdown of equipment have been infrequent.

In Honduras construction equipment is used to a much larger extent than in El Salvador and Guatemala, hence progress depends more on adequate shop facilities. One reason why the Swinerton-McClure-Vinnell firm was engaged for the work in Honduras was the experience of its engineers in tropical construction and the maintenance of long supply lines.

Servicing of equipment

Three shops were set up by the SMV organization, two for light repairs and one for heavy work. They are at camps spaced about 30 miles apart. At the heavy repair shop, detachable bits are sharpened, motors are rebuilt and general repairs are made to all types of equipment.

Each SMV superintendent has available a service truck with high-pressure greasing facilities. Their schedule is to grease each piece of equipment daily. As a further aid to keep the equipment operating, the operators are responsible to a much greater degree for the proper operation of their machines than is ordinarily the custom on highway construction in the United States. This practice has saved much work.

In northern Nicaragua, repair methods of SMV are much the same as in Honduras. Repair shops have been established at the three camps, also on about 30-mile centers.

When the work in southern Nicaragua was started by the Nicaraguan Highway Department, the department had limited repair shops available

In Guatemala and El Salvador elaborate repair shops are infrequent. More common are small blacksmith shops, such as this one in Guatemala to aid in repair of the hand tools used so extensively.

but it did have a good group of mechanics. These facilities and men have proved to be very valuable in the present work. Major repairs are made at Managua, but minor repair work can be done at the large camps.

Repair facilities available in Costa Rica vary considerably. In the northern section of the country, where the work is by the U. S. Engineers as a force-account job, few repair facilities were available until recently. However, fairly good repair shops now have been established at three camps. Nevertheless, a considerable amount of equipment is down much of the time and this condition will continue until the supply of repair parts is increased.

The Ralph E. Mills Co., which is building 71 miles of the road south of Cartago, has the best repair facilities along the highway. This condition is due to the fact that work on that section was started before the larger task of building a military road along the whole route was undertaken as a war measure. A well equipped shop was established at Cartago long before shipping space became critical and fairly good facilities subsequently were installed at the El Empalme camp 30 miles south of Cartago, at San Isidro at the south end of the 71-mile section, and at Dominical on the Pacific Ocean. Other shops are planned as the work advances.

At the Cartago shops, which must aid in maintaining over 450 pieces of equipment, including water pumps and other small units, a well trained repair crew is available consisting of 21 mechanics from the United States, 10 mechanics from Costa Rica, and 25 local mechanics' helpers.

Equipment available at the Cartago shops includes: a swing lathe, a drill press, a planer, a 60-ton press, portable welders, air compressors, an acetylene generator, a jack bit grinder, battery chargers and an air furnace. Most of these units were ordered in 1940 and were on the job before such equipment became so critical in the United States.

Minor repairs are made in the field, on the Mills project, but when some unit needs major repairs it usually is loaded onto a flat-bed truck and hauled to one of the camps for repairs. A complete file on the history and repairs required for each unit is maintained. Each piece of automotive equipment is greased every 1,000 kilometers.

When the Martin Wunderlich Co. was engaged to build a long section of the road in southern Costa Rica and Western Panama, that company had underway considerable construction in the Panama Canal area. Thus, when the firm started work on the Inter-American Highway, it was able to ship repair tools to the camps established along the highway. The Wunderlich company now has two shops in southern Costa Rica and an equal number in Panama. Many spare parts also were brought to the job. The repair methods are much the same as with the other contractors.

Airplanes deliver emergency parts

Airplanes are used to good advantage to deliver emergency repair parts and supplies and to transfer workmen from one camp to another along the Inter-American Highway. As soon as possible a small airfield with a single runway was built near each of the major camps. These fields are proving of great value.

The U. S. Army Transport Command has given much aid in delivering emergency supplies to the larger airfields, but delivery of the cargo to the small fields is usually by other planes. For this work the Swinerton-McClure-Vinnell organization operates locally two airplanes owned by the company. One is a 9-passenger Hamilton and the other a 3-place Stinson. One of these planes stops daily at each SMV camp, in Honduras and Nicaragua. The radiotelephone equipment available at each large camp enhances greatly the value of the aircraft.

Contractors employed on the highway in Costa Rica and Panama do not operate their own airplanes, but the U. S. Engineers have three passenger planes available for local use in this area, two Ford tri-motored planes and one single-motored Bach ship. They are used extensively for aiding contractors. The U. S. Engineers also rent two planes from the United Fruit Co. as needed.

In addition to the aid from the aircraft mentioned the contractors ship emergency supplies via the TACA (Transportes Aeros Centro Americanos) and Pan American airlines. Aircraft are often chartered from the former company by the contractors for special local flights. TACA pilots are accustomed to the use of small fields, and their company will accept freight to be delivered at most of the airfields along the road. Air shipments, of course, are kept to a minimum.

Who's who for the contractors

On the construction work described in the foregoing, the key personnel for the contractors are as follows: Thomas J. Burke is project manager for the Frederick Snare Corp. Martin Wunderlich, president of the Martin Wunderlich Co., is in general charge for that firm, and George Leonard is project superintendent. Tucker McClure is general manager for the Swinerton-McClure-Vinnell organization, Don Daybell, general superintendent, and Floyd Lilly, construction superintendent. The Ralph E. Mills Co. is represented by Clinton H. Wood, project manager, and Richard C. Burton, general superintendent.

Engineers having charge of the work for the Corps of Engineers, the Public Roads Administration and the Central American governments were listed in *ENR*, July 29, p. 222. To those names should be added Lt. Col. George J. F. Carey, chief of operations and Lt. Col. E. E. Valentini, special assistant to Col. Edwin C. Kelton.

Progress on the highway

Work is well advanced in some of the countries through which the Inter-American Highway passes. A military road will be available across Guatemala and El Salvador this fall, but not until late next year will construction be completed in Honduras, Nicaragua and Panama. Not until 1945 will the Costa Rican work be ended. However, driving to the Panama Canal Zone from the United States in 1945 probably will be impossible, since the remaining work in Mexico is not expected to be completed by that time. Furthermore, most of the road will only be surfaced with gravel or crushed stone.

Maintenance of the highway will be extremely high the first few years because of the nature of country through which the road passes and the many deep cuts and high fills. The agreement between the United States and the different countries requires that the United States maintain the road only so long as it is used by military traffic from this country. After the war, many of the temporary drainage structures will need to be replaced.

Observations of a Bridge Cable Unspinner

Chas. E. Andrew
Chief Consulting Engineer, Washington Toll Bridge Authority

***Contents in Brief**—Completion of unspinning operations on Tacoma Narrows Bridge affords opportunity to review difficulties resulting from a slack strand, tangling of wires in high winds, high friction caused by many wires that were not parallel, difficulty of identifying wires before cutting and slowing up of pulling by reason of the dried paint, dust and wax that was scraped off as work progressed. A solvent was unexpectedly found in ordinary kerosene.*

IT IS THE HOPE of the writer that in the future it will not be necessary to call upon any engineer to remove suspension bridge wire—at least not under circumstances such as those attending dismantling of the Tacoma Narrows Bridge. Furthermore, except in some emergency such as now exists, requiring the salvage of all available steel, it would be most uneconomical to attempt to salvage wire that had been spun into bridge cables. However, now that such wire salvage operations have been completed, it seems fitting that observations thereon should be on record for reference purposes. At some future time similar problems may have to be met. If there had been some precedent as a guide on this work, much difficulty could have been avoided.

The original plan was to remove the wire from the towers by taking one strand at a time out of the cables and lowering the entire strand to ground level, cutting it at the shore line and disposing of it by dropping it to the floor of the bay in water ranging from 60 to 250 ft. deep. Declaration of war prevented any such method by necessitating the recovery for war uses of the 3,700 tons of high tensile strength wire that was in the cables.

Looking over the job in retrospect, it appears that through various circumstances, a few of which might have been avoided, but most of which could not have been avoided, the state of Washington has made a considerable financial sacrifice to salvage and conserve this wire for the war effort. A previous article on the unspinning methods that appeared in *ENR* Jan. 14, 1943, p. 35, was written before the real difficulties developed. In the following is set forth a summary of observations that could be made only at the conclusion of the unspinning operation.

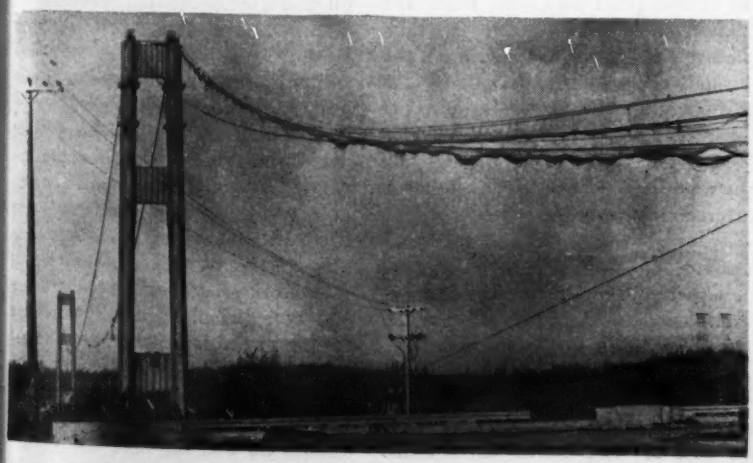


Fig. 1. Sagging, loosened wires as seen in the approach span on the Tacoma end.

Weather was one of the greatest handicaps. Actual removal of the main bridge wire was started on Nov. 7, 1942 (by coincidence on the second anniversary of the collapse). During the first month of operation weather conditions were favorable and 52 percent of the wire was removed speedily and with no great difficulty.

One strand was slack

The most serious trouble resulted from a severe wind storm that occurred after the cable bands and wrapping wire had been removed, at which time strands of the south cable were restrained only by the "Molly Hogans" (described in the earlier article). The wind was strong enough to blow loose wires upward and out of the Molly Hogans as much as 35 ft. sidewise at the center of the span.

It was this storm that complicated the difficulties with a slack strand that must have been improperly adjusted. Strand No. 11 in the south cable was found to have enough slack so that when the wrappings were removed it fell out of place and sagged down some 2 ft. below its normal position in the cable. Hanging thus when the storm struck, it was lifted by the wind and several hundred feet of it fell on the other side of the main cable, as indicated in Fig. 3.

This caused continual trouble in subsequent unspinning because the added weight of strand No. 11, lying on the other strands, greatly increased friction involved in pulling wires from strands beneath it. Because the original position of No. 11 was below the center of the cable, it was impossible to pull its individual wires until all the strands above it had been removed. Attempts were made to move No. 11 back into its original position but it was in such a tangled condition that it was impossible to replace it, especially to a position on the under side of the cable.

In the north cable, strands were not displaced by the winds as they

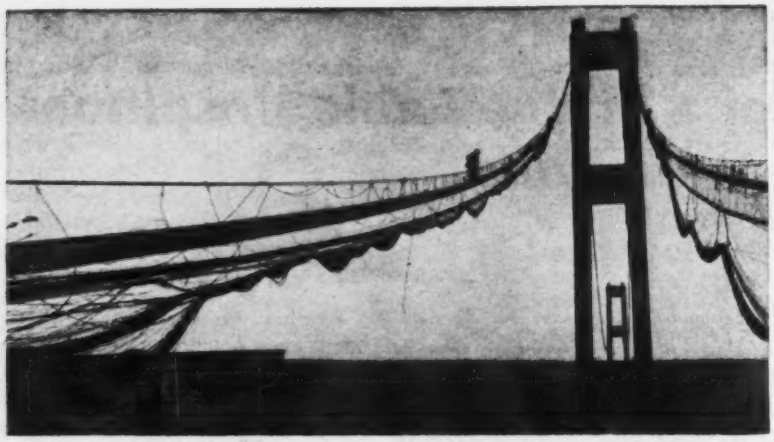


Fig. 2. Highwinds tangled the loose wire and added to the unspinning difficulties.

were held in their original position by two bands that had been put on to hold broken wires in place at the center of the span.

If loose seizings had been placed at intervals along the south cable, or even if a single band had been left in place at the center of the main span, the storm would not have caused nearly so much delay and extra work.

Method of wire removal

The original plan for wire salvage contemplated installation of steel A-frames over each saddle by means of which individual strands would be lifted out of the saddle in reverse order of placement. Each strand, as it was removed, was to be landed just outside the shoe. Four individual wires were then to be lifted out of the strand and placed on rollers or sheaves at the tower tops. These wires were then to be cut at the west anchorage and the cut ends attached to an endless hold-back cable running around sheaves at the east and west anchorage and over rollers at the towers. The wires were then to be cut at the east anchorage, attached to the reeling machines and hauled to the east anchorage.

When all the wires of a strand had thus been removed, the next strand would be lifted out and the process repeated. This scheme was not used. It had to be given up in favor of the one finally adopted, described in the Jan. 14 issue of *ENR*.

Briefly, the plan that was adopted made use of "Molly Hogans" or "U" wire loops placed around the cables at about 10-ft. intervals with the upper ends of the "U" wire attached to the hand ropes some 3 ft. above the main cable. Loose seizing was then placed around the main body of the cable at about 10-ft. intervals to provide a support for the individual wires as they were hauled in, wherever they did not run along on the cable itself.

It was the intent to cut individual wires, in the reverse order of original placing, at the strand shoes, beginning of course with the top wires in the top strand. This method depended for its success in identification, at the east and west strand shoes, on the accuracy with which wires had been kept truly parallel in the original spinning operation. After cutting a wire at the west anchorage, it was cut at the east anchorage, attached to the reeling machine and hauled in.

Individual strands could not be lifted out of the shoes on account of the loose seizings around the cable and in consequence the individual wires had to be hauled through the tower shoes. Men were stationed at each tower shoe and whenever wires could be identified and gotten hold of at that point they were lifted and placed on rollers to reduce friction. Many wires which were on top at the strand shoes were buried in the strand at the towers and could not be picked up. In these cases it was necessary to drag them through the surrounding wires, which involved overcoming very great friction.

Wires were not parallel

Experience on this project destroys confidence in the idea of "parallel wire" cables in a suspension bridge. Certainly no reliance can be placed on parallelism in a dismantling operation. We found many crossed wires as well as long spiral turns. Some strands were found to have almost complete turns. Of course the turn was not completed within a short distance and this twisting is probably not detrimental insofar as the strength of the cable is concerned but it was very effective in creating friction in the hauling of individual wires.

This twisting of the wires can be attributed to several causes operative at the time of spinning, such as defective wire adjustment, temperature movement, disturbance by compression, etc.

Dismantling a suspension bridge cable, such as this, puts emphasis on the fact that during construction too much care cannot be exercised in the spinning and adjusting of individual wires and strands.

Friction becomes a factor

The unspinning method adopted was very successful during removal of the top nine or ten strands of each cable, witness the 52 percent of total tonnage removed during the first month of operation. After the first 3 weeks, however, friction rapidly increased and hauling became more difficult. This was caused largely by deposits of zinc oxide, red lead, dust and the wax covering on wire. These substances were continually being rubbed off the wire in the hauling process and were left in the strands of wire below those being removed. These remaining strands were held together by the wire seizings in such a way that the zinc oxide, lead and wax were caught and retained. These substances, wetted by rain, formed a gummy compound which greatly increased friction. Heavy rain seemed to reduce the friction temporarily and cold weather increased it.

The idea was then conceived that oil would be beneficial. However, the addition of oil only transformed the mixture into a putty-like substance which made matters worse. Friction became so great that wires, despite their ultimate strength of 220,000 lb. per sq.in. were broken in the endeavor to pull them out. All available non-inflammable solvents were tried, without success, in attempts to dissolve the putty-like substance.

As work progressed it became more and more difficult to identify wires for cutting at the far anchorage. The result was that more and more wires were cut for each one successfully withdrawn until finally two complete strands on one side and one on the other had been cut and left lying in

place. This further increased the friction due to the added weight on the supporting strands at the west tower. It finally became necessary to cut these strands at the west tower and pull both ways. Even then a considerable part of the three strands had to be cut in short pieces from which individual wires were dropped into the bay.

A solvent and lubricant

We had hesitated to use any inflammable solvent, such as kerosene, for fear of fire. Finally we did so and to our surprise found the ignition temperature to be no higher than that of the original compound. In addition to its usefulness as a solvent, kerosene was very effective in reducing friction, in fact so much so that pulling operations, which had been brought almost to a standstill, were able to again pull the wires through, though at a lower speed than before friction became serious.

Because of the increased friction and pull required on the reels, it was necessary to do a great deal of strengthening and repair work on the equipment. Tension on the wire increased to such a point that it became difficult to remove the coils from the reels without serious injury to the wire. To correct this, re-reeling reels were set up back of the main machines and instead of removing wire coils directly from the main reels, wire was re-reeled, under light tension, to the re-reeling reels and in turn removed from them. This plan was entirely successful but it added cost and delay.

Cut wires cause trouble

A great deal of trouble was caused by the cut strands. As wires were pulled from them, other wires in contact were dragged far enough to cause sagging between the cable seizings. This necessitated much dangerous work by men out on the cable as well as the cutting out of loops and wire tangles. Some idea of this condition is given by the accompanying illustrations. Cold rainy weather made the operation more difficult and greatly reduced efficiency. As a result, the removal of the last 48 percent of wire extended over a 90-day period as compared to 30 days for the first 52 percent.

In reviewing the progress of wire removal a number of conclusions can be drawn. It must be remembered that

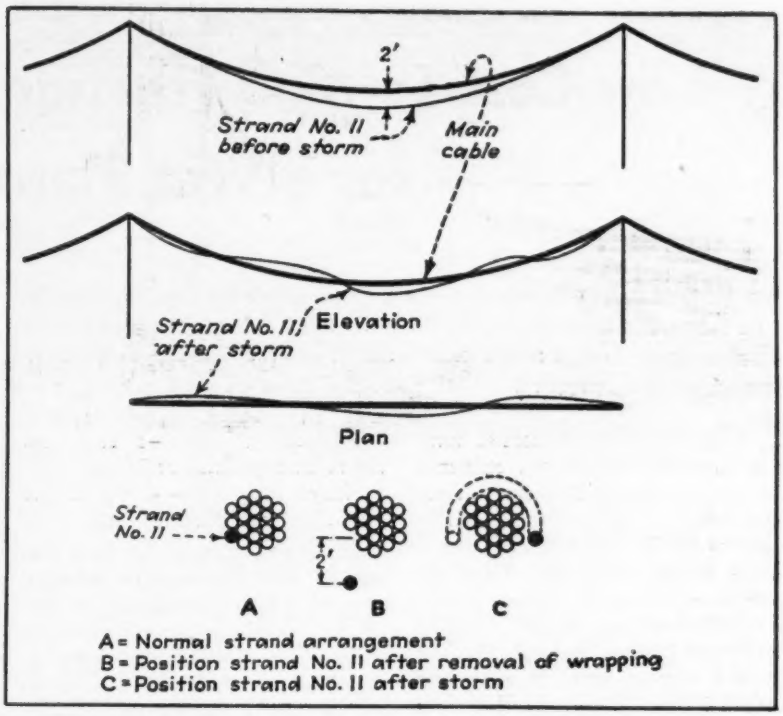


Fig. 3. Relative positions of the loose strand before and after the storm.

when this work was undertaken there was no precedent or record of past performance on similar work. The writer believes that the original plan for wire salvage would have been more successful and cheaper in the long run (although it seemed more expensive when comparisons were made at the start) than the scheme which was adopted. At the same time the writer believes that the scheme adopted would have been as successful in the removal of the last 48 percent of wire as it was on the first 52 percent if the following modifications of the method had been made:

Better method outlined

(1) If the work could have been started two months earlier to afford the advantage of good weather throughout the entire operation.

(2) At least one cable band should have been left in place at the center of the main span during the interval between removal of wrapping wire and placement of the loose seizings around the main cable.

(3) Some method of spreading apart the strands of the cable, as by strand formers placed every 200 ft., should have been used in order to expedite examination of individual strands as they were being removed, trace wires, etc., and, most important of all, to allow the zinc oxide, red lead, dust and wax to fall free of the strands below. This would have avoided accumulation of the putty-like substance which proved to be the greatest single source of trouble.

(4) No wire should be cut at the far anchorage other than those which are to be immediately pulled. The excessive cutting of wires was a source of serious trouble. Our experience indicates that dependence on the original placement of wires on the strand shoes cannot be counted on to identify wires at the other anchorage. When there is doubt as to whether the proper wires have been cut, hauling should be stopped until positive identification has been made rather than to keep cutting wires in hope of finding the right one. Separating strands or lifting them out of cable saddles would greatly expedite identification.

(5) Construction of a catwalk would not be necessary in the original scheme but would probably be necessary for the placement of strand spreaders in the scheme which was used. Possibly spreaders could have been placed from the scaffold used to remove cable bands.

(6) The original reeling machines would have been satisfactory if the foregoing modifications had been made.

Low-Cost Sewage Treatment Facilities For a War Plant

Contents In Brief—Sedimentation and two-stage sludge digestion facilities were selected to treat the sanitary sewage from an ordnance plant employing 4,500 people. Virtues of the plant were its low-cost, speedy construction and simplicity in operation.

LOW-COST SEWAGE TREATMENT facilities were desired for an ordnance works employing 4,500 people in three shifts which could be installed quickly and would have the further virtue of being simple to operate. These objectives were met by building a sedimentation-separate sludge digestion type plant costing only $42,700. The project was completed in about two month's time. Design of the plant is such that operation requires only part-time attention of one man.

Because final disposal of the sanitary sewage wastes from the ordnance works was to be in a large river, there was no need to provide for more than partial treatment. After this decision was made, the following design factors were considered:

Population—A maximum total staff of 4,500 in three shifts was assumed with the further assumption that half of the total would be on duty on the day shift.

Flow—Average 120 gpm.; maximum 500 gpm.

Settling Period—3.0 hr. for average flow; 1.0 hr. for maximum flow.

Digestion Capacity—3 cu.ft. per capita for population of 2,250.

Sludge Bed Areas—2 sq. ft. per capita for population of 2,250.

The average flow of 120 gpm. was derived from previously determined data on water consumption in each of the buildings connected to the sewer system. This 120 gpm. rate represents a per capita flow of 77 gal. per day for a population of 2,250. The maximum flow of 500 gpm. was estimated from maximum water consumption expected and included an allowance for other factors such as time of concentration of peak flows from the various areas and storage capacity in the sewer.

Determination of settling period

It was decided that the settling period should be determined from a consideration of both average and high flows, since the peaks of flow might last for periods long enough to affect sedimentation. Thus, not less than 3 hr. for the average flow and not less than 1 hr. for the maximum flow of 500 gpm. was the basis of design. The 1-hr. period for a flow of 500 gpm. determined tank size.

A plain settling tank with two sludge hoppers was used in preference to a tank equipped with sludge removing mechanism. This design was chosen for the sake of simplicity in construction and operation, and to conform with the policy of minimum use of critical materials. The arrangement of the tank follows the Imhoff principle except that the sludge hoppers are designed without storage capacity. The tank (Fig. 1) measures 22 x 35 ft. (outside dimensions) and the maximum depth is 18 ft. To reduce the use of reinforced concrete and thus steel, the partitions within the tank are of 2-in. thick lumber. A 2 x 14-ft. screening chamber is provided at the intake end and a scum collector at the opposite end.

The digestion tanks were designed for a capacity of 3.0 cu.ft. per capita for a population of 2,250. It was estimated that the working staff of 4,500 would be equivalent to a full time population of one-half that number. The two digestion tanks were designed to operate in two stages, one being covered.

The covered reinforced-concrete tank measures 14 x 16 ft. inside and has a maximum depth of 19 ft. Gas collection and heating coils are provided for the first stage, and the gas will be used as fuel for heating the contents of the tank as well as the control building.

Four Sludge beds

The sludge bed area is based on an allowance of 2.0 sq.ft. per capita for a population of 2,250. The beds were provided with simple drains and were divided by embankments rather than structural partitions. Four 23 x 50-ft. beds are available and down the centerline of each is provided a 6-in. vitrified-tile, open joint drain. Depth of the bank-run sand and gravel varies but it is 6 in. deep over the drain and is covered by 1½ in. of fine, washed sand.

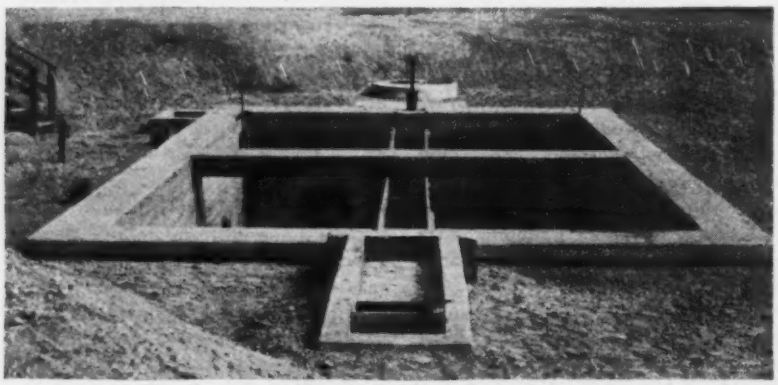


Fig. 1. The 22 x 35-ft. settling tank of two compartments provides a 3-hr. detention for the average flow of 120 gpm. and 1-hr. for the maximum flow of 500 gpm. The grit chamber is in the foreground.

Dormitories and other housing facilities on the project add to the load on the sewage treatment plant. However, since the peak flows from the dormitories will not occur at the same time as those from the manufacturing areas, it was assumed that there would be no increase in the estimated peak flow through the treatment plant.

The estimated average flow, however, was increased to 170 gpm. The settling period for this average flow is 2 hr. 15 min. Therefore, no increase was made in the settling tanks to provide for the additional dormitory load.

In connection with the sludge digestion tank design it was estimated that the housing would add an equivalent population of about 500 to the original estimate of 2,250. This reduced the original 3 cu.ft. allowance per capita to 2.45 cu.ft. Because the time of digestion in the sludge tanks remained at approximately 50 days, no increase in capacity was recommended. The present sludge drying beds are considered ample, but can be easily enlarged if necessary.

The sewage treatment plant has been designed for simplicity in operation and maintenance. Part-time of one man will be required, with some additional help occasionally for removing sludge from the drying beds and to keep the grounds clean. Operating attention on the day shift only is considered sufficient.

Fig. 2. Four sludge beds each 22.5 x 50 ft. are available, which provides 2 sq.ft. of bed area per capita. A timber gate in the earth walls permits access to each bed by trucks and other equipment.

Regular duties at the settling tanks include the following:

Screens are raked at intervals and screenings are buried.

Sludge is pumped from each of the two hoppers every day, sometimes oftener if convenient.

Scum or floating material is cleaned from the surface of the tank daily and the scum also is drawn as necessary from the gas vent at the center of the tank. The scum is pumped to the sludge tank as drawn and the piping and connections flushed clean after every operation.

Instructions for operating the sludge digestion facilities include the following:

The control building at the sludge tanks houses most of the equipment at the plant. Operations in this building include pumping raw sludge, control of the flow from the first to the second-stage digestion tanks, drawing sludge to the drying beds, control of the supernatant, attention to the heating plant, and control of the collection and use of the gas. The various operations can be followed by reference to the flow diagram shown in Fig. 3.

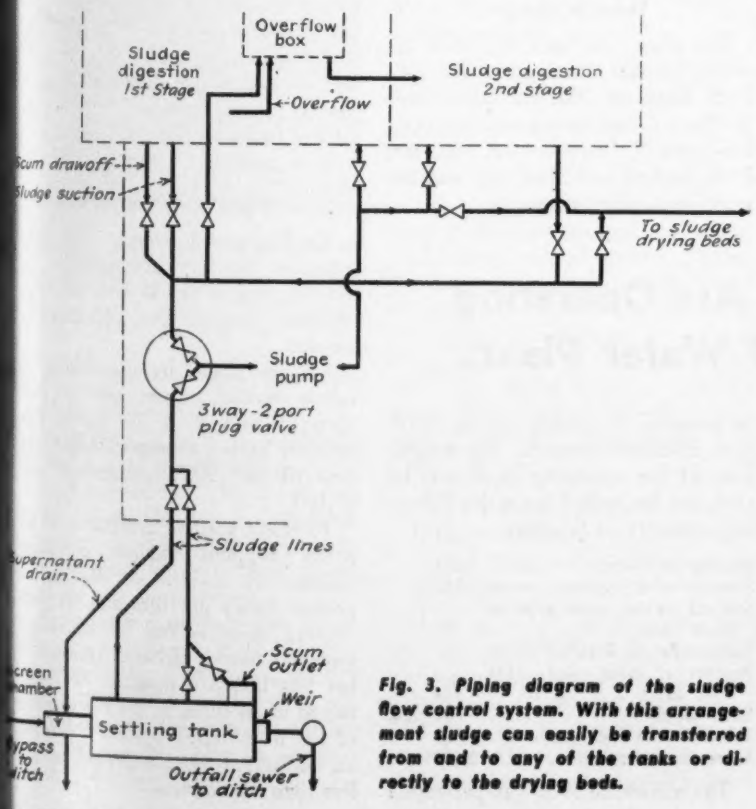


Fig. 3. Piping diagram of the sludge flow control system. With this arrangement sludge can easily be transferred from and to any of the tanks or directly to the drying beds.

Operation is simple

The operations are briefly as follows:

1. Raw sludge and scum are pumped daily from the settling tanks to the first-stage digestion tank.

2. During pumping, the material displaced in the first-stage tank flows through the overflow box to the second stage. This may be supernatant or sludge, depending upon the quality of sludge in the first-stage tank.

3. As the second-stage tank becomes full, the supernatant is drawn off to the settling tank from one of two taps located at different elevations in the tank. The connection supplying the clearest supernatant is used.

4. During drying weather sludge is drawn from the second-stage tank to the drying beds. The quantity

Fig. 4. Control building is built beside the sludge digestion tanks. The stack on the roof is the waste gas burner.

drawn at any one time should be sufficient to fill a bed to a depth of 10 or 12 in.

5. The temperature of the first-stage sludge tank is observed daily and the rate of heating water adjusted as necessary to maintain a temperature at 85 to 90 deg.; the heating water should not be permitted to become warmer than 140 deg.

6. The first-stage digestion tank is kept full of sludge to provide the longest possible digestion period.

7. Regular observations of sludge should be made at the pump discharge while pumping so as to keep the raw sludge heavy, and to ascertain the condition of any other sludge being pumped.

8. Sludge in all pipelines is to be placed in movement once a week to prevent packing and plugging lines.

9. Material should never be drawn in large quantities or rapidly from the first-stage tank, as this would have a tendency to break the vacuum seal in the tank cover and draw air into the tank with danger of producing an explosive mixture.

These in charge

The plant was built by force account by the Huntington, W. Va., U. S. Engineer District, Col. Wilson B. Higgins, district engineer and Maj. Benjamin T. Rogers, area engineer. E. B. Badger and Sons Co., was the architect-engineer-manager.

Army Engineers Are Operating More Than 700 Water Plants

Operation of 710 water supply installations, for which designs and construction had previously been carried out, is one of the vital tasks of the Army. This was described by L. H. Kessler, principal civil engineer of the repairs and utilities branch of the construction division of the War Department, at a recent meeting of the American Water Works Association.

Mr. Kessler reported that more than 1,000 waters are encountered at posts differing in chemical analysis from that of practically distilled water to supplies containing up to 2,300 ppm. of dissolved solids. The magnitude of the operating problems, he said, can be judged from the following summary of facilities:

Number of stations	1,044
Stations using purchased water	334
Stations having some type of plant	710
Stations having filtration plants	91
Number of filter plants (191 mgd. cap.)	144
Daily supply	500 mgd.
Miles of 4- to 30-in. main	6,608
Miles of service	2,680

The allowance of 55 gal. per capita per day during World War I was found to be inadequate, and the new plants that were built conform to the following standards:

Airfields, Camps, Cantonments	
Mobilization type construction	100 gpcd.
T of O type	70 gpcd.
Permanent Army Posts	150 gpcd.
Armored Divisions	150 gpcd.
Hospital Areas	150 gpcd.
Animals	25 gpd./animal
Plant, Post and Storage Projects	35 to 50 gpc./hr./shift
	100 gpcd. for resident personnel

Other factors considered

In March, 1942, provisions were made for unforeseen contingencies in water supply by multiplying the foregoing per capita rate by the following capacity factors:

Project Population	Factor
10,000 and less	2
20,000	1.50
30,000	1.25
40,000	1.10
50,000	1.00

A breakdown of water supply facilities, by types, reveals the following:

Purchased	38.2%
Well	41.2
Surface	20.6

All problems considered, said Mr. Kessler, well supplies have proven the most satisfactory type of supply for Army purposes. Although shallow wells are not always as dependable as deep wells, they usually supply a more desirable water with respect to both chemical quality and cold temperature.

Waste water surveys

The largest reduction in water consumption has been accomplished by the insertion of urinal flush valves to eliminate constant flow, reported Mr. Kessler.

At one place the installation of valves reduced water use to 55.6 gpcd., a saving of 26 gpcd. The monthly saving averages $1,083; the cost of the 200 flushometers was $1,100.

To effect positive protection of all Army supplies against pollution, whether by accident or design, the present policy provides that all posts (except those served by municipal systems) have a chlorine residual of not less than 0.4 ppm., to be maintained at all times in the active parts of the distribution system following an additional contact period of not less than 30 minutes.

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Shear Plates Pinch-Hit as Wheels

A dolley for delivery 1,500-lb. loads of timber sheathing along the crown of a large hangar roof was recently built from materials conveniently at hand. The timber frame was made of 2-in. lumber, using side pieces of a width that should safely transfer the load to the axle. The lower edges of the sides were faced with steel straps, at the center, and a curved recess provided a bearing for the axle. The axle was a ¾-in. bolt held in place in its outboard bearing at each end by a cover plate.

The 4-in. shear plates, plentiful on this job, made ideal wheels because eight or nine of them could be used together, thus distributing the load over a considerable width. The dolley operated on a track consisting of a pair of 2-in. planks leveled up (on the curving crown of the roof) by wedges placed on the lower side.

A bolt and some shear plates serve as axle and rollers for this job-made dolley.

A Side Hill Foundation Problem

Heavy oil switches in steel tanks had to be located on a side hill above the Pacific Gas and Electric Co.'s Pit River 5 powerhouse. The foundation was not the best and loose overburden, subject to movement, made it undesirable to have anything that would function as a retaining wall.

Accordingly, a concrete pier or column was put down under the location for each of the concentrated loads (oil switches), and a deck was supported on brackets extending out from the column heads on all four sides. This type of structure gave the

Concrete platform carries sidehill load with minimum resistance to surface movement.

desired support with only a minimum of resistance to downhill movement of surface material.

Field and Office Comment

Simplified Slide Rule Computations

Sir: The writer wishes to submit comment on the slide rule method for square roots demonstrated in *Engineering News-Record* by Leonard Jordan May 20, 1943, on p. 764.

The problem is to find the square root of 5357.94. Instead of finding 73.1 from a table of squares as being the largest three figure number whose square is less than 5357.94, the writer looks for the three-figure number whose square is nearest to 5357.94, viz: 73.2, whose square is 5358.24. The discrepancy between these squares is 0.30. The author next writes the equation:

$$x^2 = y = 5358.24$$

Differentiating,

$$2x\,dx = dy = 0.30$$

Solving,

$$dx = \frac{.30}{2(73.2)} = .002049$$

Applying this correction to X the writer gets 73.2 — .002049 = 73.17951 as the square root of 5357.94. This number is accurate to the last figure and involved much less work than that performed by Mr. Jordan for a comparable result.

The device of correcting an approximate value by differentiating the equation containing the approximate value is exceedingly old. The writer first saw it used by a professor of astronomy in correcting some rather complicated equations where trigonometric functions were involved.—R. W. STEWART, *Engineer of Bridge Design, City of Los Angeles, Calif.*

Welded Penstock Failures

Sir: Have hammer-welded penstocks given rather unsatisfactory service throughout the entire country?

This question arises because seven penstock failures on the west coast have involved defects in seams of the old hammer-welded type.

A typical result of one of these failures is shown in the accompanying picture. The cause was found to be "defect in weld . . . . Actual fusion had occurred only on a thin edge along the outer surface of the seam for a length of 6 to 8 in."

A recent failure of hammered welds dumped an avalanche of water into a powerhouse where generators were running. The resultant damage was

When a defective weld failed, water pressure tore away sound metal.

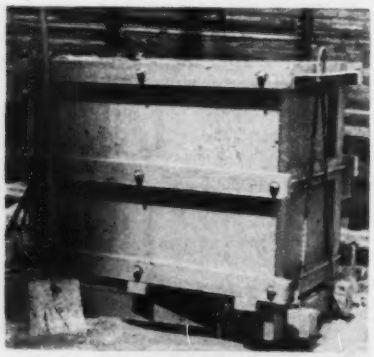
so costly that the power company determined to test a similarly welded penstock when the plant served could be shut down and safeguarded against water damage. As was feared, when subjected to minor water-hammer, one of the hammer welds ruptured. Whether the remainder of the welds have a higher factor of safety remains uncertain.

Must we test all the old hammer-welded penstocks to be safe?—K. T. ROBERTS, *San Francisco, Calif.*

Box for Cement Clean-Up

Where bulk cement is dumped from metal cans brought in by truck to the Pit 5 tunnel, being constructed in California by Pacific Gas and Electric Co., it is desirable to have a convenient means for gathering spillage that occasionally occurs. A job-made container consists of a timber frame built up of 2x4's on a base of 4x6's. The box is about $2\frac{1}{2}$x$3\frac{1}{2}$ ft. in plan and 4 ft. high. To carry the pressure against the side walls three runs of three $\frac{3}{4}$-in. steel tie rods are used.

The box is picked up with a three-point suspension. The $\frac{1}{2}$-in. supporting cables used for this pickup run down around the 4x6's in the base.



Plywood-lined box convenient for collecting spillage at bulk cement unloading stations.

Skid Frame of Light Unit Used for Fuel Tank

A Texas contractor relying upon a portable generating set for lighting, greatly extended the interval between refueling by employing the pipes of the skid frame and lifting unit as an extra tank, as illustrated by the accompanying picture. The contents of the entire pipe frame was several

Because the pipes of the skid form a part of the gasoline tank, this unit can operate for long hours without being refueled.

times that of the small fuel tank regularly furnished with the engine.

The suction from the fuel pump was connected to one of the base members. This arrangement assured a head of fuel until the entire supply had been utilized.

One corner pipe was brought up through the penthouse roof for a filler spout, and equipped with a pipe cap. The filler spout, being outside the roof from the engine itself, permitted fuel to be added at any time. This location also eliminated the danger of fire or explosion through any fuel spilled on the hot engine.—CHARLES C. LYNDE, *P. O. Box 1,129, Houston, Texas.*

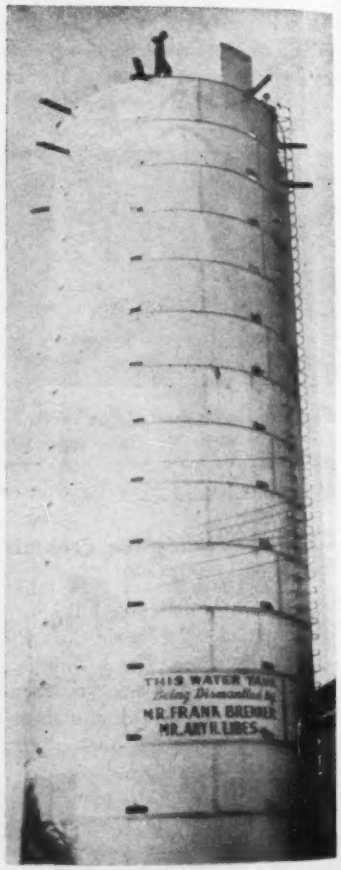
Novel Scaffold Speeds Tank Dismantling

Demolition of an unused water tank at Winston Salem, N. C., called for considerable ingenuity because the old, 85 by 25-ft. standpipe was tightly hemmed in by buildings and high tension wires. The tower was dismantled piecemeal from the top down, the only tools used being oxyacetylene cutting equipment and scaffold timbers.

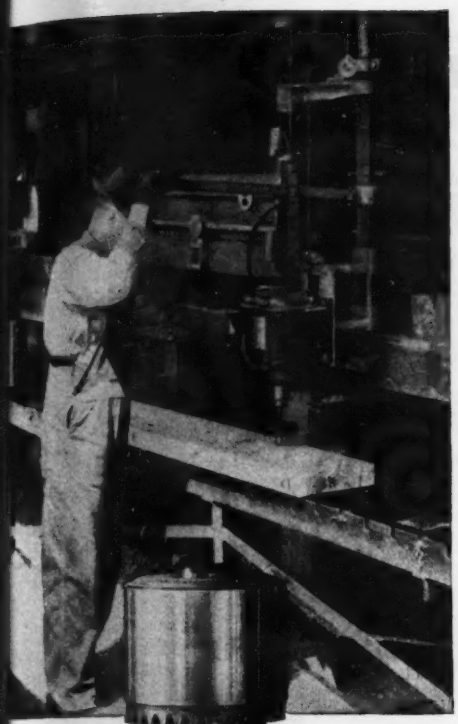
Entrance to the bottom of the tank was gained by using the torch to cut an opening through the plate of the lowest ring section. A timber scaffold, 4-ft. square, was erected at the center of the tank with level braces at about the same elevation as the joints in the tank plates. Rectangular slots, about 4 by 15 in., were cut at the bottom of the second ring of plates above ground, and radial boards were inserted through the slots, their inner ends resting on the level timbers of the scaffold.

Workmen standing on these boards cut holes at the bottom of the next ring of plate, and from there on up to the top of the tank it was a simple matter of repetition, the radial planks being raised from one ring of slots to another as the erection of the scaffold in the center progressed.

The actual dismantling operations were carried on from catwalk planks laid close to the inside shell of the tank and supported on the radial boards. A number of vertical cuts were made with the oxyacetylene torch in the top ring of plate. Horizontal cuts at the bottom of the plate were made while helpers held each piece of plate until it was severed. These pieces were carefully dropped to the soft ground and removed immediately so that following sections would not bounce off them. The job was completed quickly without property damage or personal injury.



Catwalks inside of shell give workmen easy access to top ring of plates for oxyacetylene burning and controlled dropping to dismantle tank.



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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

NONCONNAH BASIN SEWERS MEMPHIS, TENN.

OWNER: Dept. of Public Works, Memphis, Tenn.; W. B. Fowler, city engineer.

PROJECT: Constructing and improving 9 miles of sanitary sewers from Getwell along Nonconnah Creek to Tennessee Chute, Shelby County, Tenn. Project was divided into three sections for speed in completion. Concrete sewer and culvert pipe used throughout. (Project No. Tenn. 40-242 N.F.)

CONDITIONS: Contractor to furnish all material except for manhole rims which are to be furnished by city, and is to complete work in 150 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.625 per hour; semi-skilled, 60c. to $1.00; and common labor, 45c.

BIDS: Bids on all sections were originally asked April 27, 1943. These were all rejected as being too high because when the contractors visited the site the Mississippi River was at flood stage and most of the area through which the sewer passes was covered with water. Bids were again asked on May 11, 1943 with the low bidders on Sections II and III receiving contracts. Bids on Section I were rejected at that time. On June 22, 1943 bids were opened on a modified and curtailed version of Section I with F. D. Harvey of Memphis, Tenn., receiving the award, the price being $115,512. Results of the June 22 and the May 11 openings are shown below with all of the bidders listed, and unit prices of the three low bidders tabulated.

Section I—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening; all bids rejected.)

1. Samuel Kraus, St. Louis, Mo. (low bidder) $306,317
2. Drainage Contractors, Inc., Detroit, Mich 332,672
3. V. P. Loftis Co., Charlotte, N. C 334,748
4. Michael Pontarelli & Sons, Chicago, Ill 361,386
5. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich. 373,887
6. Forcum-James Co., Memphis, Tenn 394,442
7. Gardner Constr. Co., Nashville, Tenn 412,142
8. W. L. Hailey & Co., Nashville, Tenn 414,786
9. R. H. Wright & Son, Columbus, Ga 635,399

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Outfall structure, complete	1 ea.	$20,222.00	$11,000.00	$14,181.99
2. Extra length piling	10 l. f.	5.00	2.00	3.78
3. 48-in. conc. sewer pipe, 8–10 ft. deep	100 l. f.	12.03	14.40	10.35
4. As above, 10 to 12-ft. deep	584 l. f.	12.78	15.00	11.23
5. As above, 12 to 14-ft. deep	600 l. f.	13.68	16.70	12.29
6. 48-in. conc. culv. pipe, 14 to 16-ft.	100 l. f.	15.19	19.50	13.90
7. As above, 16 to 18-ft. deep	1,570 l. f.	16.38	20.50	19.40
8. As above, 18 to 20-ft. deep	3,093 l. f.	17.73	21.50	20.69
9. As above, 20 to 22-ft. deep	2,100 l. f.	19.18	22.50	28.05
10. As above, 22 to 24-ft. deep	400 l. f.	20.83	25.00	32.59
11. As above, 24 to 26-ft. deep	200 l. f.	22.63	26.20	37.11
12. As above, 26 to 28-ft. deep	100 l. f.	24.53	27.50	43.39
13. As above, 28 to 30-ft. deep	300 l. f.	25.58	28.50	49.25
14. 48-in. conc. culv. pipe in tunnel	521 l. f.	107.00	60.00	38.93
15. 42-in. conc. sew. pipe, 0–6-ft. deep	200 l. f.	8.76	11.00	6.79
16. As above, 6 to 8-ft. deep	550 l. f.	9.28	11.50	7.48
17. As above, 8 to 10-ft. deep	400 l. f.	9.85	12.00	8.23
18. As above, 10 to 12-ft. deep	116 l. f.	10.58	12.60	9.14
19. As above, 12 to 14-ft. deep	1,007 l. f.	11.45	14.30	10.10
20. 42-in. conc. culv. pipe, 12–14-ft. deep	211 l. f.	11.70	15.00	10.64
21. 42-in. conc. sew. pipe, 14–16-ft. deep	600 l. f.	12.48	16.00	11.22
22. 42-in. conc. culv. pipe, 16–18-ft. deep	100 l. f.	13.90	17.50	17.23
23. As above, 18 to 20-ft. deep	71 l. f.	15.20	18.50	18.44
24. 42-in. conc. culv. pipe in tunnel	108 l. f.	115.00	70.00	37.22
25. 36-in. conc. sew. pipe, 0–6-ft. deep	185 l. f.	7.75	9.30	5.95
26. 36-in. conc. sew. pipe, 6–8-ft. deep	444 l. f.	8.20	9.60	6.53
27. As above, 8 to 10-ft. deep	100 l. f.	8.80	10.00	7.25
28. As above, 10 to 12-ft. deep	89 l. f.	9.75	10.70	8.04
29. 24-in. conc. sew. pipe at relief manhole	61 l. f.	6.00	10.00	8.23
30. Special section curved conduit	251 l. f.	35.00	50.00	22.62
31. Siphon No. 1 (3 manholes), complete	1 ea.	15,452.00	13,000.00	14,608.84
32. Siphon No. 2 (3 manholes), complete	1 ea.	15,610.00	20,000.00	19,290.74
33. Siphon No. 3 (3 manholes), complete	1 ea.	9,210.00	10,000.00	13,316.18
34. Standard 5-ft. dia. manholes	4 ea.	154.50	150.00	103.23
35. Extra depth, 5-ft. manholes	21.9 ver. ft.	21.50	20.00	17.77
36. Standard 6-ft. dia. manholes	10 ea.	185.85	200.00	178.42
37. Extra depth- 6-ft. manholes	150 ver. ft.	36.05	30.00	31.23
38. Special 7-ft. dia. manhole	1 ea.	330.00	450.00	371.00
39. Special 7½-ft. dia. manhole	1 ea.	355.00	500.00	360.30
40. Concrete in masonry (1:2:4)	100 c. y.	25.00	25.00	22.75
41. Remove, replace concrete pavement	27 s. y.	4.00	7.00	3.64
42. Conc. in masonry and fndn. (1:3:6)	60 c. y.	15.00	18.00	26.00
43. Timber foundation for pipe	128 Mbm.	80.00	70.00	67.70
44. Timber bracing left in place	20 Mbm.	65.00	35.00	82.50

Section I-A—Nonconnah Basin Sewers

LIST OF BIDDERS: (June 22 opening; awarded)

1. F. D. Harvey, Memphis, Tenn. (contract) $115,512
2. M. T. Reed Constr. Co., Belzoni, Miss 115,950
3. Drainage Contractors, Inc., Detroit, Mich 124,822
4. W. L. Sharpe Contracting Co., Memphis, Tenn 140,061
5. Samuel Kraus Co., St. Louis, Mo 149,409

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Outfall structure, complete	1 ea.	$6,500.00	$8,990.00	$7,000.00
2. 48-in. conc. sew. pipe, 10–12-ft. deep	284 l. f.	14.90	14.08	16.00
3. As above, 12 to 14-ft. deep	552 l. f.	16.30	14.63	17.25
4. 42-in. conc. sew pipe, 0–6-ft. deep	200 l. f.	9.30	9.30	11.50
5. As above, 6 to 8-ft. deep	550 l. f.	10.60	9.91	12.00
6. As above, 8 to 10-ft. deep	400 l. f.	11.90	10.80	13.50
7. As above, 10 to 12-ft. deep	116 l. f.	13.10	11.58	14.30
8. As above, 12 to 14-ft. deep	1,007 l. f.	14.30	12.43	15.00
9. 42-in. conc. culv. pipe, 12–14-ft. deep	211 l. f.	14.80	12.73	18.00
10. 42-in. conc. sew. pipe, 14–16-ft. deep	600 l. f.	15.60	13.58	17.00
11. 42-in. conc. culv. pipe, 16–18-ft. deep	100 l. f.	17.20	14.92	18.50
12. As above, 18 to 20-ft. deep	71 l. f.	18.40	16.14	19.50
13. 42-in. conc. culv. pipe in tunnel (Nonconnah Yd.)	108 l. f.	36.00	43.33	70.00
14. 36-in. conc. sew. pipe, 0–6-ft. deep	185 l. f.	7.30	8.00	10.00
15. As above, 6 to 8-ft. deep	444 l. f.	8.30	8.92	10.20
16. As above, 8 to 10-ft. deep	100 l. f.	9.30	9.46	10.60
17. As above, 10 to 12-ft. deep	89 l. f.	10.30	10.10	11.20
18. 24-in. conc. sew. pipe at relief manhole	3 l. f.	13.70	5.50	10.00
19. Special section curved conduit	251 l. f.	60.00	38.50	50.00
20. Siphon No. 2 (Horn Lake Rd.) complete	1 ea.	20,000.00	24,000.00	22,000.00
21. Siphon No. 3 (Sta. 119+63) complete	1 ea.	14,850.00	11,300.00	10,000.00
22. Std. 5-ft. diameter manhole	4 ea.	115.00	160.00	160.00
23. Extra depth 5-ft. dia. manhole	22 ver. ft.	17.00	20.00	21.00
24. Standard 6-ft. dia. manhole	1 ea.	120.00	180.00	210.00
25. Extra depth 6-ft. dia. manhole	11 ver. ft.	28.00	27.00	32.00
26. Special 7½-ft. manhole, complete	1 ea.	400.00	380.00	500.00
27. Conc. masonry in structures (1:2:4)	100 c. y.	16.00	20.00	25.00
28. Remove, replace concrete pavement	27 s. y.	6.00	10.00	7.50
29. Conc. in masonry struct., fndn. (1:3:6)	60 c. y.	18.00	18.00	20.00
30. Timber foundation for pipe	45 Mbm.	50.00	80.00	70.00
31. Timber bracing left in place	20 Mbm.	40.00	60.00	35.00

Section II—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening, awarded.)

1. G. M. Ferris, Athens, Tenn. (contract) $287,777
2. V. P. Loftis Co., Charlotte, N. C 300,338
3. Samuel Kraus, St. Louis, Mo 315,416
4. Smith & Pew Constr. Co., Atlanta, Ga 317,040
5. Drainage Contractors, Inc., Detroit, Mich 344,096
6. M. T. Reed Constr. Co., Belzoni, Miss 362,313
7. Forcum-James Co., Memphis, Tenn 375,083
8. Michael Pontarelli and Sons, Chicago, Ill 398,234
9. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich. 414,126
10. W. L. Hailey & Co., Nashville, Tenn 456,999
11. Gardner Constr. Co., Nashville, Tenn 463,045
12. R. H. Wright & Son, Columbus, Ga 682,392

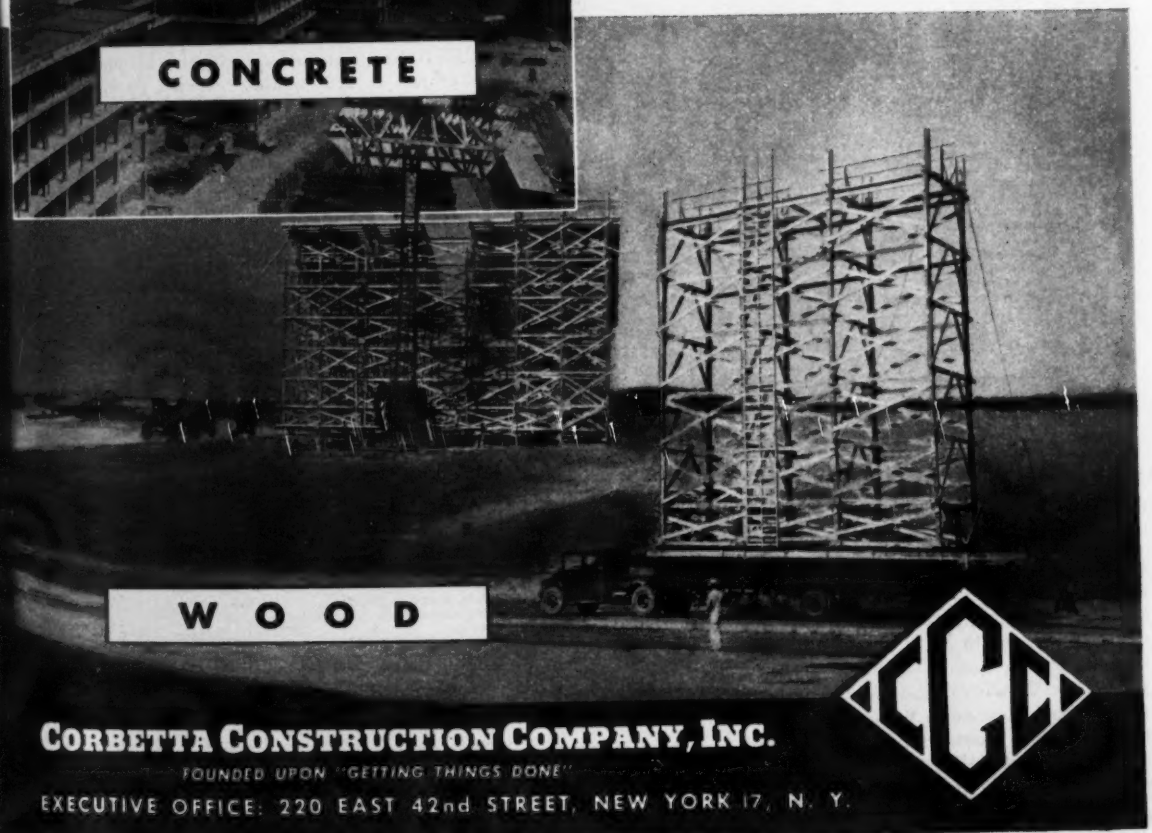
Item	Quan.	Unit Prices (1)	(2)	(3)
1. 42-in. conc. sewer pipe, 0–8-ft. deep	200 l. f.	$7.55	$7.46	$9.20
2. As above, 8 to 10-ft. deep	1,100 l. f.	8.15	8.23	9.65
3. As above, 10 to 12-ft. deep	4,842 l. f.	9.05	9.14	10.30
4. As above, 12 to 14-ft. deep	8,627 l. f.	10.20	10.10	11.45
5. As above, 14 to 16-ft. deep	5,094 l. f.	12.00	11.21	12.60
6. 42-in. conc. culv. pipe, in turne) (RR).	78 l. f.	40.00	34.92	60.00
7. 42-in. conc. culv. pipe, in tunnel (hwy.).	84 l. f.	40.00	34.92	60.00
8. 24-in. conc. sew. pipe at relief manhole	3 l. f.	8.00	8.23	6.00
9. Siphon No. 4 complete (3 manholes)	1 ea.	7,100.00	7,664.11	8,170.00
10. Siphon No. 5 complete (3 manholes)	1 ea.	20,200.00	20,802.98	18,500.00
11. Siphon No. 6 complete (3 manholes)	1 ea.	9,000.00	11,857.32	7,940.00
12. Siphon No. 7 complete (3 manholes)	1 ea.	12,900.00	16,133.04	11,005.00
13. Siphon No. 8 complete (3 manholes)	1 ea.	11,800.00	14,406.77	10,265.00
14. Standard 5-ft. diam. manholes	26 ea.	135.00	103.23	154.00
15. Extra depth, 5-ft. diam. manholes	204 ver. f.	18.00	27.77	21.00
16. Conc. in masonry (1:2:4)	120 c. y.	25.00	22.77	25.00
17. Conc., masonry and found'n (1:3:6)	20 c. y.	22.00	28.66	15.00
18. Timber foundation	187 Mbm.	30.00	67.39	60.00
19. Timber bracing, left in place	10 Mbm.	30.00	82.08	65.00
20. Bitum. pavmt. removed, relaid	20 s. y.	4.00	3.34	4.00

(Contract Unit Prices continued on page 100)

"At Home" on ALL Types of Construction!

STEEL

CONCRETE



WOOD

CORBETTA CONSTRUCTION COMPANY, INC.

FOUNDED UPON "GETTING THINGS DONE"

EXECUTIVE OFFICE: 220 EAST 42nd STREET, NEW YORK 17, N. Y.

OMA NEBRASKA WEST VIRGINIA PENNSYLVANIA OHIO MARYLAND DELAWARE NEW JERSEY

Section III—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening; awarded.)

1. Smith & Pew Constr. Co., Atlanta, Ga. (contract) ... $305,533
2. L. O. Brayton & Co., Dyersburg, Tenn ... 329,846
3. Forcum-James Co., Memphis, Tenn ... 330,663
4. Drainage Contractors, Inc., Detroit, Mich ... 340,066
5. V. P. Loftis Co., Charlotte, N. C ... 353,601
6. M. T. Reed Constr. Co., Belzoni, Miss ... 363,601
7. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich. ... 366,202
8. Michael Pontarelli & Sons, Chicago, Ill ... 374,553
9. Samuel Kraus Co., St. Louis, Mo ... 382,576
10. Gardner Constr. Co., Nashville, Tenn ... 511,553
11. W. L. Hailey Co., Nashville, Tenn ... 520,358
12. R. H. Wright & Son, Columbus, Ga ... 661,254

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 36-in. conc. sewer pipe, 8-10-ft. deep	100 l. f.	$7.50	$8.00	$8.25
2. 36-in. conc. sew. pipe, 10-12-ft. deep	10,059 l. f.	7.50	8.65	8.75
3. As above, 12 to 14-ft. deep	792 l. f.	8.50	9.25	9.25
4. As above, 14 to 16-ft. deep	5,501 l. f.	9.00	11.00	10.25
5. 36-in. culv. pipe in tunnel (RR.)	68 l. f.	30.00	40.00	45.00
6. 36-in. culv. pipe in tunnel (hwy.)	170 l. f.	30.00	40.00	45.00
7. 30-in. conc. sew. pipe, 10-12-ft. deep	190 l. f.	6.00	7.60	10.00
8. 24-in. conc. sew. pipe, relief manhole	6 l. f.	8.00	8.50	9.50
9. 18-in. sewer pipe, 10 to 12-ft. deep	50 l. f.	3.50	3.00	4.30
10. As above, 12 to 14-ft. deep	470 l. f.	4.00	3.20	4.90
11. As above, 14 to 16-ft. deep	400 l. f.	5.00	4.00	5.50
12. As above, 16 to 18-ft. deep	150 l. f.	6.00	5.00	6.20
13. 12-in. sewer pipe, 0 to 6-ft. deep	60 l. f.	2.00	1.80	1.75
14. As above, 6 to 8-ft. deep	50 l. f.	3.25	2.00	2.00
15. As above, 8 to 10-ft. deep	1,040 l. f.	2.50	2.20	2.25
16. As above, 10 to 12-ft. deep	4,475 l. f.	3.00	2.50	2.50
17. As above, 12 to 14-ft. deep	1,675 l. f.	3.50	2.70	2.75
18. As above, 14 to 16-ft. deep	775 l. f.	4.00	3.40	3.75
19. As above, 16 to 18-ft. deep	445 l. f.	5.00	4.20	5.00
20. As above, 18 to 20-ft. deep	250 l. f.	6.00	4.50	6.25
21. As above, 20 to 22-ft. deep	700 l. f.	7.00	5.00	8.00
22. 12-in. sew. pipe in tunnel (rdwy.)	120 l. f.	20.00	25.00	25.00
23. 12-in. sew. pipe in tunnel (railroad)	20 l. f.	20.00	25.00	30.00
24. 10-in. sew. pipe, 0 to 6-ft. deep	48 l. f.	1.40	1.70	1.50
25. As above, 6 to 8-ft. deep	480 l. f.	1.90	1.90	1.75
26. As above, 8 to 10-ft. deep	1,050 l. f.	2.25	2.10	2.00
27. As above, 10 to 12-ft. deep	907 l. f.	2.60	2.37	2.25
28. As above, 12 to 14-ft. deep	1,990 l. f.	3.00	2.60	2.50
29. As above, 14 to 16-ft. deep	1,692 l. f.	3.70	3.30	3.50
30. As above, 16 to 18-ft. deep	950 l. f.	5.00	4.10	4.50
31. As above, 18 to 20-ft. deep	700 l. f.	6.00	4.40	6.00
32. 8-in. sewer pipe, 8 to 10-ft. deep	444 l. f.	2.10	2.50	1.90
33. As above, 10 to 12-ft. deep	378 l. f.	2.50	2.75	2.15
34. As above, 12 to 14-ft. deep	300 l. f.	2.90	3.00	2.40
35. As above, 14 to 16-ft. deep	200 l. f.	3.50	3.65	3.40
36. As above, 16 to 18-ft. deep	140 l. f.	4.00	4.50	4.65
37. Siphon No. 9 complete (3 manholes)	1 ea.	7,500.00	8,200.00	8,000.00
38. Siphon No. 10 complete (3 manholes)	1 ea.	12,500.00	10,200.00	8,000.00
39. Siphon No. 11 complete (3 manholes)	1 ea.	8,500.00	9,600.00	7,600.00
40. Siphon No. 12 complete (2 manholes)	1 ea.	2,500.00	1,500.00	3,000.00
41. Siphon No. 13 complete (3 manholes)	1 ea.	11,500.00	13,500.00	10,000.00
42. Standard 5-ft. diameter manholes	23 ea.	120.00	175.00	150.00
43. Extra depth 5-ft. dia. manholes	179 ver. f.	17.50	25.00	20.00
44. Standard 4-ft. diameter manholes	18 ea.	100.00	150.00	140.00
45. Std. 4-ft. manholes (rims by city)	22 ea.	95.00	147.00	130.00
46. Extra depth 4-ft. manholes	271 ver. f.	16.00	20.00	17.00
47. Drop construction, 12-in.	5.5 ver. f.	10.00	10.00	18.00
48. Concrete in masonry (1:2:4)	50 c. y.	15.00	30.00	21.00
49. Conc. in masonry and fndn.	20 c. y.	14.00	27.50	19.00
50. Timber foundation for pipe	112 Mbm.	50.00	60.00	75.00
51. Timber bracing left in place	316 Mbm.	50.00	60.00	75.00
53. Bituminous pavmt. removed, replaced	3,860 s. y.	3.30	2.50	2.50
53. Bermuda sod	150 s. y.	.50	.50	.30
54. 6-in. sewer pipe, 6 to 10-ft. deep	245 l. f.	1.50	2.00	2.00

STORM WATER SEWER WASHINGTON, D. C.

OWNER: District Commissioners, Dept. of Sanitary Engineering, Washington, D. C.

PROJECT: Construction of South Capitol St. storm water sewer between Anacostia River at Poplar Point and Portland St., in Washington, D. C. Almost 3,400 ft. of reinforced concrete pipe sewer to be laid; sizes are 7½-ft., 6½-ft. and a twin 5-ft. pipe, and in addition a 6½-ft. diameter culvert pipe sewer. Bracing of the sewer trench is required to protect against land movements noticeable in previously laid sewers in this section. Contractor is also required to dispose of unsuitable fill material at points specified by the District Engineer.

CONDITIONS: Contractor to furnish all materials and complete work in 260 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.50 to $2.00 per hour; semi-skilled, 75c. to $1.25 and common labor, 75c.

BIDS: The three low bids, opened June 10, 1943, range from the contract low of $419,081 to $459,209. Award made June 25 to low bidder.

LOW BIDDERS:

1. National Structures Corp., New York, N. Y. (contract) $419,081
2. Leo Butler Co., Silver Springs, Md 458,99
3. Drainage Contractors, Inc., Detroit, Mich 459,20

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation (all types)	31,220 c. y.	$1.70	$3.00	$3
2. Concrete masonry "CC"	3,020 c. y.	20.00	20.60	28
3. Sewer brick masonry	30 c. y.	40.00	45.00	50
4. Rein. conc. pipe sewer, 7½-ft. dia.	2,040 l. f.	45.00	37.10	39
5. Rein. conc. pipe sewer, 6½-ft. dia.	810 l. f.	40.00	33.50	36
6. Rein. conc. culv. pipe sewer, 6½-ft. dia.	400 l. f.	70.00	54.00	50
7. Twin 5-ft. dia. rein. conc. pipe sewer	195 l. f.	60.00	38.80	40
8. 24-in. concrete pipe sewer	885 l. f.	4.00	4.95	4
9. 21-in. concrete pipe sewer	330 l. f.	3.00	4.40	3
10. 18-in. concrete pipe sewer	360 l. f.	2.70	3.40	3
11. Untr. timber bearing piles	162,350 l. f.	.50	.80	
12. Sewer trench bracing	133 l. f.	40.00	83.80	125
13. Gravel, sewer subgrade	1,390 ton	4.00	3.30	5
14. Terra cotta pipe underdrain, 6-in.	12,575 l. f.	.40	.40	
15. Bracing lumbers	173 M bm.	20.00	50.00	35
16. Rubble stone masonry	2 c. y.	60.00	150.00	150
17. Concrete masonry	50 c. y.	30.00	22.00	30
18. Borrow excavation	1,200 c. y.	1.00	1.00	1
19. Dispose of unsuitable fill matl.	1,200 c. y.	1.00	.50	
20. Overhaul (quarter-mile)	2,400 c. y.	.10	.10	

HIGHWAY IMPROVEMENTS, NEW MEXICO

OWNER: New Mexico State Highway Dept., F. M. Linbaugh, State Highway Engineer.

PROJECT: Grading, minor drainage structures, three multiple-span concrete box culverts each over 20-ft. clear span, base surfacing, and other miscellaneous construction on U. S. Highway No. 84 and 85 between Santa Fe and Las Vegas, in San Miguel and Santa Fe Counties, N. Mex. Approximate length is 8.679 miles.

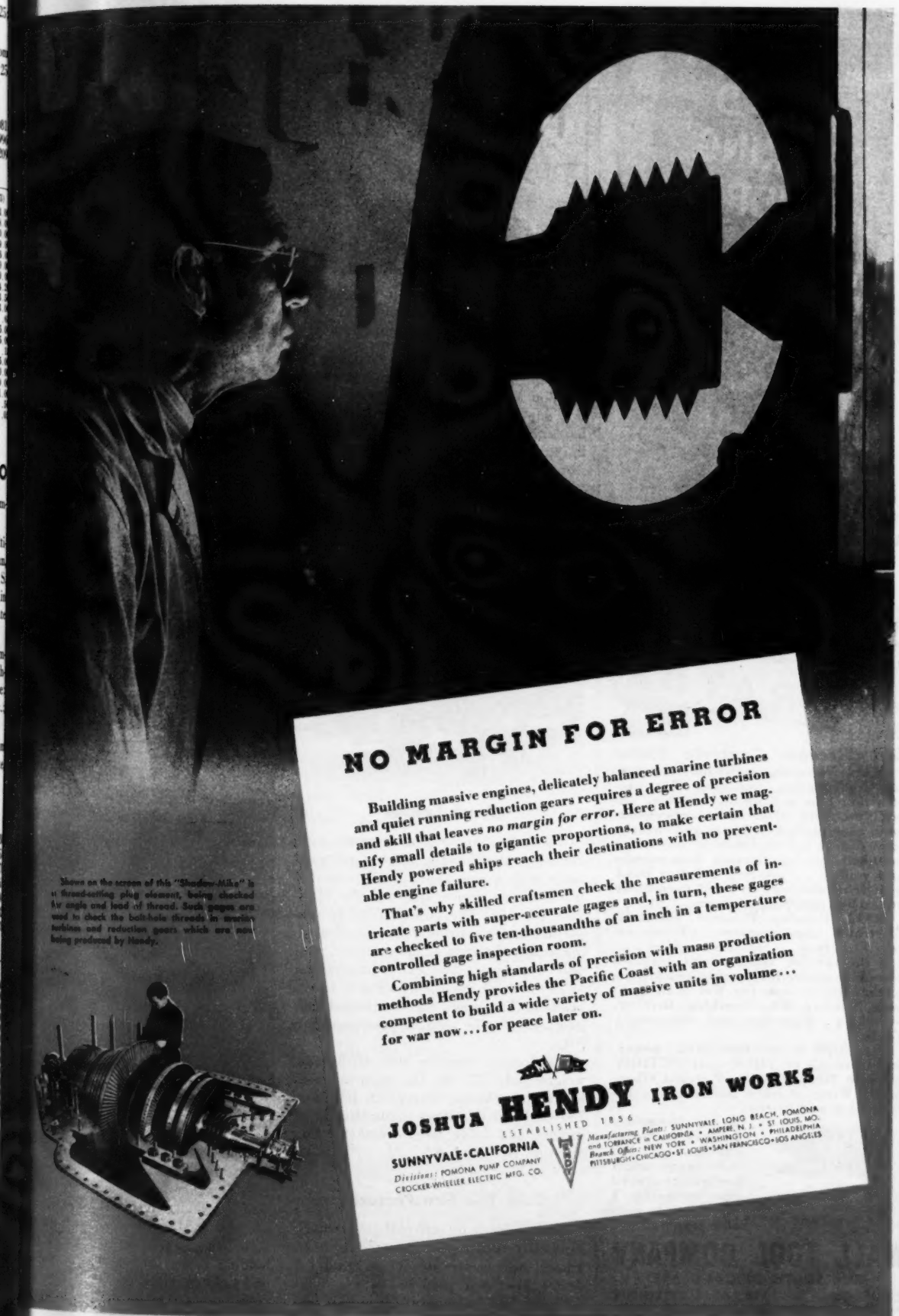
CONDITIONS: Contractor to furnish all materials and complete project in 200 weather working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.50 per hour; semi-skilled, 60 to 80c. and common, 45 to 55c.

BIDS: Seven bids were received July 6, 1943, ranging from the contract low of $380,630 to $538,378. Engineer's estimate $492,567.

LIST OF BIDDERS:

1. D. D. Skousen & Co., Albuquerque, N. Mex. (contract) $380,63
2. A. O. Peabody, Santa Fe, N. Mex 398,35
3. Martin & Cowart, Albuquerque, N. Mex 434,07
4. C. A. Switzer & Co., Denver, Colo 449,26
5. Henry Thygesen Co., Albuquerque, N. Mex 474,60
6. Lowdermilk & Bros., Denver, Colo 479,20
7. Brown Bros., Albuquerque, N. Mex 538,37

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	Lump Sum	$500.00	$500.00	$500
2. Remove obstructions	Lump Sum	300.00	100.00	25
3. Excavation, unclassified	302,000 c. y.	.265	.40	
4. Excavation for structures	8,100 c. y.	1.50	.75	2
5. Excavation for pipe culverts	2,660 c. y.	1.50	1.00	2
6. Overhaul	628,000 sta. y.	.02	.005	
7. Haul	42,000 ½-mi. y.	.10	.10	
8. Rolling, sheepsfoot roller	4,025 hr.	3.00	4.00	4
9. Base course surf., No. 1 aggregate	37,654 ton	1.04	.95	1
10. Watering	3,014 M gal.	2.00	2.25	2
11. Untreated timber check dams	352 l. f.	3.00	3.00	4
12. Class A concrete culverts	2,971 c. y.	22.00	18.45	25
13. Reinforcing steel	351,180 lb.	.054	.065	
14. Plain conc. pipe culvert, 24-in. diam., 4½-in. shell	2,624 l. f.	4.75	4.00	4
15. As above, 30-in. diam., 5½-in. shell	2,856 l. f.	5.80	5.00	5
16. Concrete monument and marker (unrein.)	2 ea.	30.00	25.00	25
17. Bracing	80 ea.	4.00	2.00	2
18. Right-of-way and station markers	95 ea.	5.00	4.00	5
19. Remove and rebuild fence	11,700 l. f.	.06	.10	
20. Obliterating old road	0.13 mi.	500.00	100.00	100
21. New posts for rebuilding fence	400 ea.	.50	1.00	
22. Contour ditches	27,200 l. f.	.08	.03	
23. Ballast	128.70 ton	.68	.75	
24. Mechanics tamping	1,245 hour	2.00	2.50	4
25. Reflectorized warning posts	134 ea.	6.00	5.00	7
26. Warning posts	67 ea.	6.00	4.50	1



Shown on the screen of this "Shadow-Mike" is a thread-cutting plug element, being checked for angle and lead of thread. Such gages are used to check the bolt-hole threads in marine turbines and reduction gears which are now being produced by Hendy.

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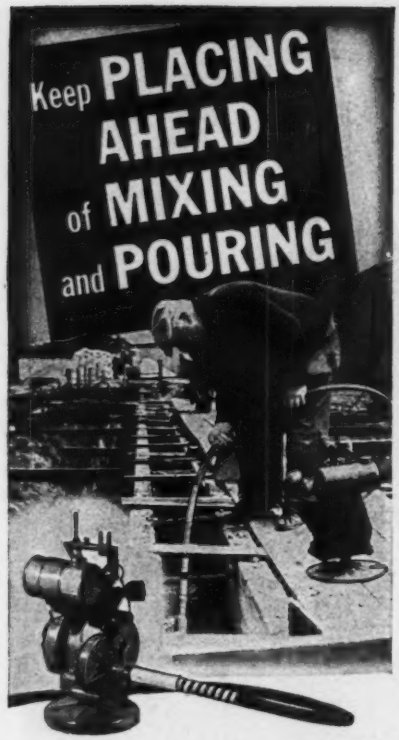

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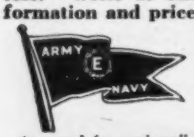

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Only a limited supply of tool steel is available, and a special formula chemical solution has been developed to conserve that supply. It is claimed that with this hardening solution cutting edges are hardened, tool life is prolonged and tools stand greater punishment and need less regrinding. The use of the solution makes heat-treating steel tools easy, as no drawing or tempering are required. It is available in 5, 10, 30 and 55 gallon containers.—*Steeltem Chemical Co., 51 East 42nd St., New York, N. Y.*

Truck Loader

One man, instead of several, it is claimed, can handle heavy, awkward loads with a new hydraulically-operated truck-loading device, known as the "Tailgate Loader." The powerful lift is simple to control; raising, lowering or holding at any elevation is accomplished with only one lever. The entire mechanism locks up to the truck body when in raised position. The wood, steel-reinforced tailgate may also be used without operating lift.

The loader, complete with all fittings, weighs only 670 lb. Its powerful 5-in. hydraulic cylinder, which can lift from 750 to 1,500 lb., stops automatically at ground and body level.—*Anthony Co., Streator, Ill., Dept. 62.*

Coal Pile Fire Protector

The tendency of soft coal to overheat, especially when first stored, is well known, and costly fires often result. A device has been perfected which, it is claimed, will safeguard industrial coal piles from the very real danger of spontaneous combustion. Hot-spot indicators and quenchers operate in this way: Long rod-like instruments are inserted in coal piles at intervals of about 20 feet. If overheating starts in the coal pile, the signals pop up to indicate that a temperature of 150 deg. F. has developed at the point indicated. Then the quenchers are loaded with dry ice and forced down to where the heat is developing. This gasses and freezes the hot spots, and prevents ignition, making it unnecessary to go to the trouble and expense of removing the coal.

Through vents in the quenchers, a cubic foot of dry ice will expand to more than 700 times the volume in CO_2 gas at 150 deg. F., so that 100 lb. of dry ice will more than fill the interstices of one carload of soft coal.—*Coal Specialties Co., 50 Church St., New York, N. Y.*

Magnetic Clamp

Intended for shipyard and other heavy uses is a new magnetic clamp for positioning welded members. The clamp is an electro-magnetic tool, of relatively light construction as compared to its holding power. Stiffeners are positioned and held in place by this clamp, while tack welds are made directly, without the

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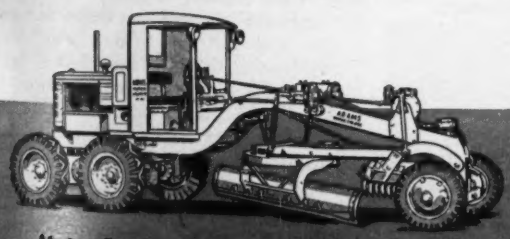

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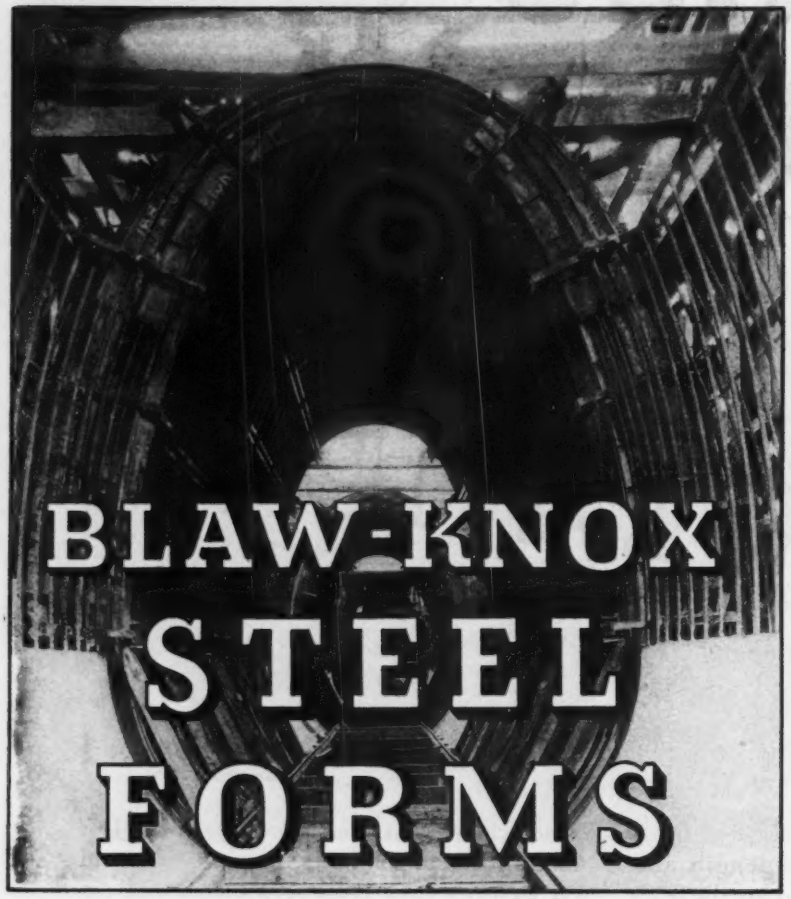
Utilize Blaw-Knox experience in job planning . . . . . .



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This is a service which Blaw-Knox has given without charge to engineers and contractors for more than 36 years, resulting in the economical building of thousands of concrete projects, both large and small, with the use of Blaw-Knox Steel Forms.

Current construction work of a sufficiently urgent nature can now be served, and long range planning for the proper handling of future jobs can be aided by experienced Blaw-Knox engineers.

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CONDUITS ROADS SEWAGE DISPOSAL PLANTS . . .
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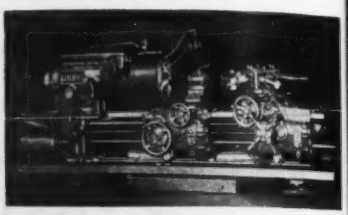
use of saddle clips, or other means requiring temporary welds. The manufacturer claims that time is cut about two-thirds, chipping is unnecessary, materials are conserved, and stresses from temporary welds are avoided.

Three models are available. Models B and C are two-magnet units, coupled together with a yoke, with vertical and horizontal adjustments; Model HVC is composed of a 3-section horizontal magnet and a 1-section vertical magnet, and is furnished with a Johnson bar. Model B of two 2-section magnets exerts a pull of 3½ tons on ½-in. plate and weighs 210 lb.; Model C, two 3-section magnets, exerts a pull of 4½ to 5 tons on ½-in. plate, and weighs 300 lb.—*Glenn-Roberts Co., 1009 Fruitvale Ave., Oakdale, Calif.*



Heavy-Duty Turret Lathe

Important new features are incorporated in a new line of Type H heavy-duty turret lathes, and sizes are standardized for both the regular line and for fixed-bed and sliding-bed machines. The five standard sizes of this lathe are built with different size spindle bores for various classes of work, but eight other sizes and types of lathe are available for special uses. The machine permits easier handling of large parts on a production basis, and is powered by a 40 hp. motor. Company engineers are available for consultation on special requirements.—*International Machine Tool Corp., Libby Division, Indianapolis, Ind.*

New Glue

Mindful of the needs of workers in wood, a new phenol-resin glue, Cascophen LT-67, has been developed. Said to be the most durable type of glue now being used in construction of wood products, it is proof against cold and boiling water, dry heat, extreme cold, mold, bacteria and organic solvents.

It is also claimed that this glue is non-acid and will not weaken wood fibers adjacent to the glue line, that it has a wide range of setting temperatures—70 deg. F. and up for soft woods, 110 deg. F and up for hardwoods—and a long permissible assembly period; that it is non-crazing, with good filling action on rough surfaces; and that it is adaptable, with low pressure, to numerous methods of assembly.—*Casein Company of America, 350 Madison Ave., New York, N.Y.*

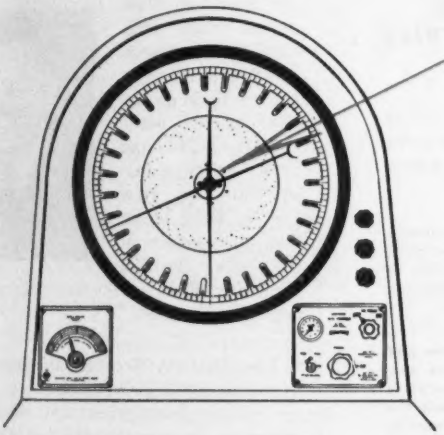
Number 2 of a series covering use and maintenance of Southwark Testing Machines

War Service Memo: To users of Southwark testing machines

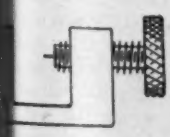
the proper positioning of

Indicating Hands

The extremely sensitive and accurate Southwark-Tate-Emery indicator operates as a mechanical potentiometer using air for power. When the air pressure is off and the indicator at rest, the black hand should point directly downward. If because of shock or any other reason it does not, it should be removed and corrected.



Use the hand jack (illustrated), furnished with the machine, to remove it. In replacing it in the proper position (over the letter "T" in the space between the ends of the scale) the hand should be firmly driven on the tapered shaft using a short squared end tube which is tapped sharply with a light wrench.

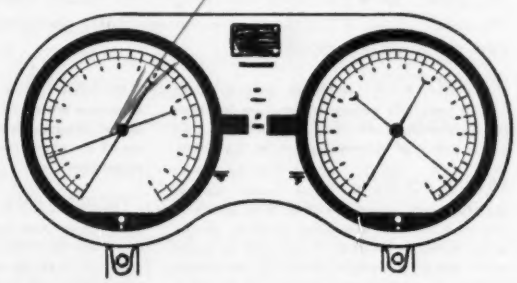


If this simple precaution is taken, there should never be any difficulty in setting to "O" by means of the normal adjustments.

It is extremely rare that the red maximum hand requires adjustment. If it should become necessary, however, the hand should be disassembled and the spring washer bent very slightly as required.

Hundreds of Southwark machines with bourdon tube gages are still in service. With normal no-load conditions, the black indicating hand and the rotatable dial of these bourdon tube gages should be in about the position shown. If not, it should be positioned properly following the same procedure in removing and replacing hand as described above.

The red "max" hand of these bourdon tube gages has no friction washer. The proper friction is produced by the



lubricant used on the shaft. Vaseline at the center of the shaft is used for maximum friction, a mixture of vaseline and oil for less. In reassembly be careful to tighten the nut which holds the shaft only slightly to avoid binding the hand. The least friction which will prevent coasting is desired.

BLW THE BALDWIN GROUP **BALDWIN SOUTHWARK**

Division THE BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa.

2 STRIKES AGAINST THIS CABLE

LOOK OUT FOR THAT 3RD STRIKE..

It's the one that puts the cable, machinery, and valuable copper out of the game. Don't let this happen in your plant. Follow the simple rules for cable care. Post them in a conspicuous place where your workmen can see them every day.

DRAGGING — Never drag a cable. Coil it carefully before attempting to move it. It doesn't take long, yet it does add extra years of operating life to the cable.

MOISTURE — Keep cable out of moisture whenever possible, both when in use and out of use. Just a flick of the wrist is often all that is required to move cable out of a puddle of water. A minute or two is well spent when used to roll a cable reel into a sheltered place.

ABRASION — Avoid unnecessary abrasion which will cause disintegration of cable sheath and shorten cable life, or result in short circuits causing production stoppage.

"TOW LINE" — Electric cable and wire were not designed for use as tow lines for hauling equipment to the place where it is to be used. This will strain the cable, damage it at point of connection to the equipment.

Don't allow cable to kink. If this does happen however, remove the kinks carefully and immediately to prevent damage to the cable sheath. Keep cable out of sun, away from heat such as steam lines and furnaces. Excessive heat ages rubber rapidly, cuts down cable life. Repair cuts, nicks and damaged places on cable sheath immediately. Guard against overloading cable. Don't allow heavy equipment to run over cable.

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MANUFACTURERS' ACTIVITIES

JOHN E. MATEER, since July, 1940, assistant superintendent of the open hearth department of Lukens Steel Co., Coatesville, Pa., has been appointed superintendent of that department, it has been announced by L. M. Curtiss, general superintendent. Mr. Mateer succeeds Herman J. Hofmann, who is resigning on account of his health.

THE NAME of the Dowty Equipment Corp. of Long Island City, N. Y., has been changed to Hub Industries, Inc., according to an announcement made recently by Alec E. Ulmann, president.

JOSEPH L. MULLIN has been appointed general superintendent of foundries for the American Manganese Steel Division of the American Brake Shoe Co., according to an announcement made recently. He had been works manager at the New Castle, Del., plant, but will operate in his new position from the offices of the company at Chicago Heights, Ill.

THE BRISTOL CO. has announced the appointment of J. W. Peckham as manager of the development and design engineering department. He will make his headquarters at Waterbury, Conn.

RECENTLY D. W. Onan & Sons, Minneapolis, Minn., were awarded the Army-Navy "E" at official ceremonies at the Minneapolis Auditorium. Col. H. J. Keeley, Commander at Fort Snelling, made the award.

GOVERNMENT-FINANCED plants for production of a total of 255,000 tons of synthetic rubber annually, or more than a third of the output scheduled under the government's entire program, will be in operation in Texas within the next 90 days, James J. Newman, vice-president of the B. F. Goodrich Co., reports. This quantity will be the total output of four

plants, all of them "polymerization" units in which butadiene and styrene, produced from Texas petroleum and natural gas will be combined to make butadiene-type synthetic rubber.

D. A. Robison has resigned as vice president of the Caterpillar Tractor Co., Peoria, Ill., to become the company's distributor at Salt Lake City, Utah, and Gail Spain, who was made a vice president in May 1942, will succeed him as administrative vice president of the advertising, sales, export, engine sales, special products and war contracts departments, according to an announcement by L. B. Neumiller, president of Caterpillar. Mr. Robison is a native of Nevada and was graduated from the University of Nevada and almost immediately became associated with Caterpillar, starting in the shipping room of the parts department at San Leandro, Calif. in 1926. He advanced rapidly through various positions and became vice president in 1940.

Mr. Spain, who has been in charge of operations at San Leandro since his elevation to the vice-presidency, is returning to Peoria to assume his new responsibilities. He is a native of Portland, Ore., and a graduate of the Oregon State College, at Corvallis, Ore.

Henry A. Berger, 62, patent engineer for the Timken Roller Bearing Co., at Canton, Ohio, for the past 14 years, died recently. He was a graduate in engineering of the University of Illinois.

Gordon S. McKenty has been appointed general parts department manager of R. G. LeTourneau, Inc., of Peoria, Ill. to supervise parts sales, orders and shipping activities of the earthmoving machinery company. In recent months Mr. McKenty has been an expediter on government munitions contracts, working out of both the Georgia and Vicksburg, Miss. LeTourneau factories.

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No medals have been handed out for distinguished pumping service, but CARVER *Certified* PUMPS are being "decorated" daily with the highest award there is in the construction equipment field — *repeat orders.*

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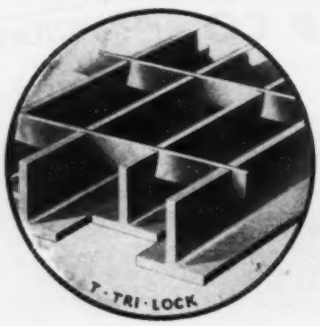
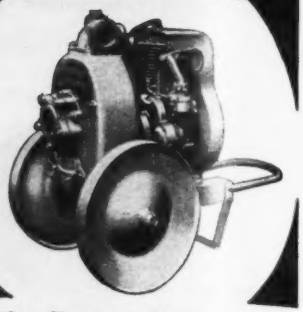


Spot and Seam Welding—The American Welding Society has recently approved and published a bulletin entitled "Recommended Practices for Spot and Seam Welding of Low Carbon Steel." The data contained in this bulletin has been compiled by canvassing approximately 60 fabricators of mild steel structures and resistance welding equipment manufacturers. The bulletin is composed of two charts—one each for spot and seam welding, together with an explanation for their use. It represents what is said to be the best information available at this time on the subject of spot and seam welding of low carbon steel and describes the standard practice during the war emergency. The research was initiated by the Resistance Welding Research Committee of the Welding Research Council and has been approved by the Resistance Welding Standards Committee of the American Welding Society.—*American Welding Society, 33 West 39th St., New York, N. Y.*

Water Softeners—A new publication describes the many uses and applications of the newly developed carbonaceous zeolite softeners, particularly as pertains to the treatment of boiler feed water supplies. It describes also the chemical reactions and general arrangement of the equipment, the results to be achieved, and the application to different water supplies, and other pertinent information of value to engineers considering water softener problems.—*Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.*

Speed Nut System—A 20-page illustrated catalog showing 50 new speed nut and speed clip applications. It explains how the speed nut system performs multiple functions by combining two or more parts into one. It shows how self-retaining speed nuts eliminate parts handling and how riveting operations are reduced. It lists maximum load limits for speed nuts of all sizes and includes engineering data showing how speed nuts conquer vibration loosening.—*Tinnerman Products, Inc., 2120 Fulton Road, Cleveland, Ohio.*

JAEGER "SURE PRIME"



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MEN AND JOBS

The retirement of **Carl J. Josenhans,** senior engineer with the Wilmington, N. C., District U. S. Engineer's office, has been announced. Mr. Josenhans entered the employ of the office in 1909, and except for a period of four years when he was engaged in the design and construction of highway bridges throughout eastern North Carolina, he had served there continuously.

One of the best known civil engineers in North Carolina, Josenhans, is a graduate of the University of Michigan, class of 1907, with the degree of B.S. in civil engineering. As resident engineer for the Wilmington District office, he was in charge of the construction of the $2,500,000 Harbor of Refuge at Cape Lookout, N. C., which incloses by means of a 7,650-ft. rubble stone breakwater an area of about 575 acres with a mean low water depth of 40 ft. to provide shelter for coastwise ships.

J. M. Jarrett has been appointed director of the division of sanitary engineering of the North Carolina State Board of Health to succeed Warren H. Booker, resigned. Mr. Jarrett is civil engineer from North Carolina State College and has been on duty with the United States Public Health Service at Norfolk, Va., since November, 1942, as a sanitary engineer with the rank of major.

Lt. J. M. Coffey is engineer and area supervisor of a malaria control program being carried out near Kinston, N. C., by the U. S. Public Health Service to protect military and civilian personnel in the section.

Colonel Ralph J. Griffin is the new district engineer for the U. S. Army Engineers at Cincinnati, Ohio. Taking his place as executive officer is Major Hugh A. Graff.

New appointments in the Oklahoma Highway Department are **J. D. Jenkins,** Muskogee, Division Engineer; **W. W. Trotter,** Dunca, Division Engineer, and **Ray Stanley,** Clinton, Division Engineer.

John U. Shroyer, secretary of the Department of Highways of Pennsylvania has announced that $400,000 has been allocated for post-war road building in Western Pennsylvania, and indicates that a similar outlay is expected for Eastern Pennsylvania. **E. L. Schmidt,** former Pittsburgh District Engineer, has been promoted to supervising engineer in the same area to direct the work. Mr. Shroyer says that they are considering the appointment of an engineer to take charge of plans for road improvement in

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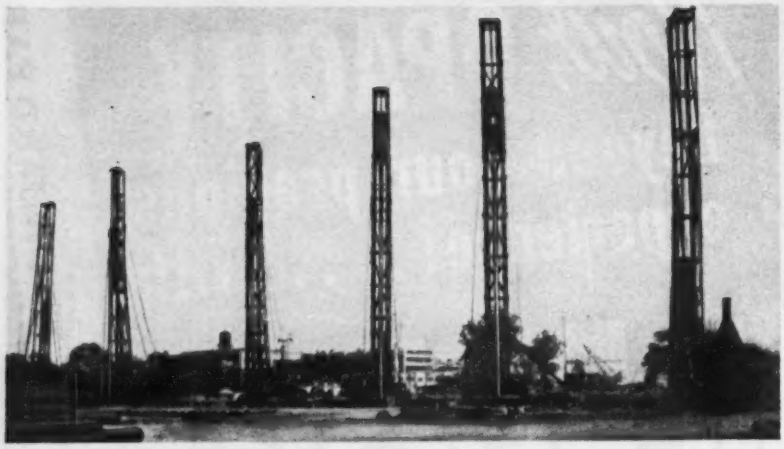

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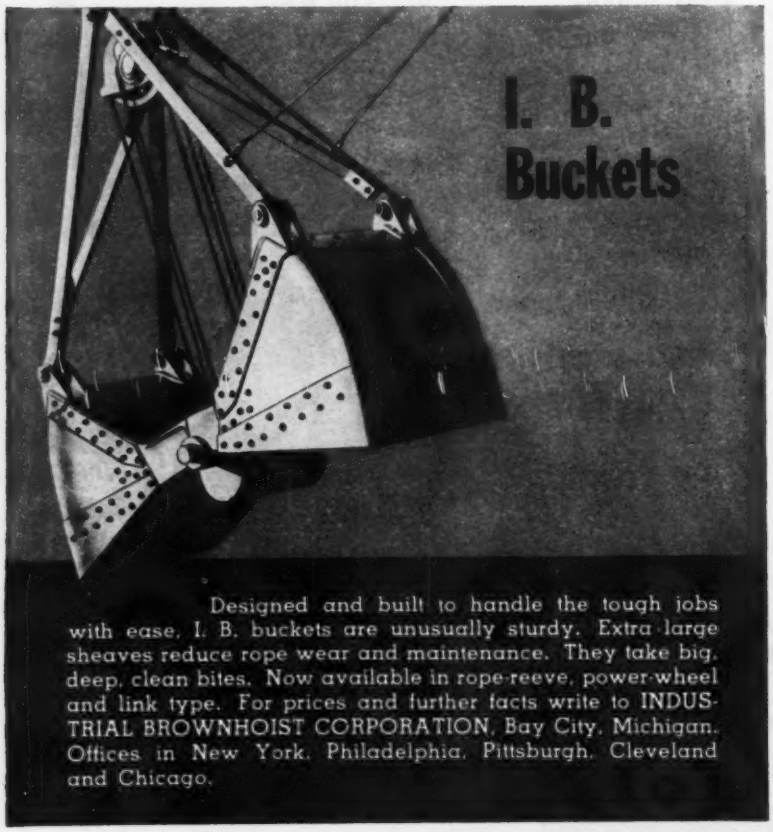

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Philadelphia and extension of the Pennsylvania Turnpike from Harrisburg to Philadelphia.

Samuel Gould, Mahoning County, Ohio, engineer, has been appointed by the county commissioners coordinator for Mahoning county's postwar planning program. Gould has been authorized to proceed with plans for postwar projects and to take part in state and local conferences of various planning groups.

Roy S. Braden, manager of Federal Governmental Experimental Community at Greenbelt, Md., has been appointed city manager of High Point, N. C., to fill the place of E. M. Knox, deceased.

J. C. Baker, assistant chief engineer of the Arkansas state highway department, has been placed in charge of all state force work. **M. C. Methvin** will continue to be in charge of regular maintenance operations for the department.

Keith Boyd, with the North Dakota state highway department for 17 years, has resigned as materials engineer, to accept the post of chief of the flexible payment branch of the U. S. Engineers experimental station at Vicksburg, Miss.

Raymond G. Ridgely, engineer, who is superintendent of the St. Petersburg, Fla., city water supply system, was on July 21 named acting city manager, succeeding Glenn V. Leland, resigned. Mr. Ridgely began his new duties July 22.

Manuel Santos is at present associated with the building construction firm of Iglehart, Caldwell & Scott, Inc., as resident engineer for buildings, roads, etc., under construction at West Point for the U. S. Military Academy, under supervision of the U. S. Army Engineers.

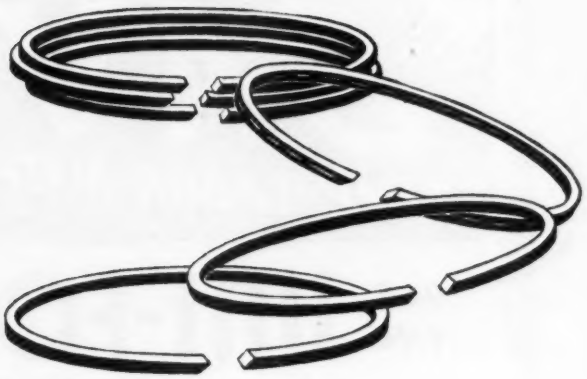
Lt. Col. John Thornton Knight, Jr., former resident of New Orleans, has been appointed district U. S. Engineer at Wilmington, N. C.

Sanford P. Starks of Madison, Wis., has been chosen state planning board engineer for Wisconsin. He will devote his time largely to plans for postwar improvements and new construction at a number of the state's institutions.

Robert Blais, of Ottawa, Ont., has been named assistant chief engineer of the Dominion Department of Public Works.

Capt. Carl H. Cotter, CEC, USN, has been named director of the Pacific division of the Bureau of Yards and Docks, U. S. Navy.

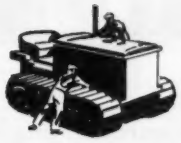
u can replace your
orn-out pajamas in
minutes . . .



. . . but it may take weeks
to replace a set of
bad piston rings

e answer is
eventive Maintenance
w with Shell
esel Lubricants

SHELL



IN TODAY'S high-speed Diesels, temperatures in the piston-ring area range from 350° to 500° F. With a temperature variation such as this not only the lubricating oil itself must be good, but the lubricating system must be checked thoroughly and often For under these severe temperature conditions, the use of "just any oil" or an insufficient amount of even the best oil, will cause piston rings to stick. Then hot gases blow-by the pistons, temperatures rise . . . rings are ruined.

And because piston rings are not easy to get in a hurry these days you've got a tied-up piece of equipment . . . something no operator wants. That's why it's extremely important that more than the "normal" amount of care be taken to assure the proper lubrication of your engines. This will mean more frequent check-ups . . . more attention paid to the quality of the lubricant used. But those few extra minutes will be well spent when compared to the costly delays they can help you avoid.

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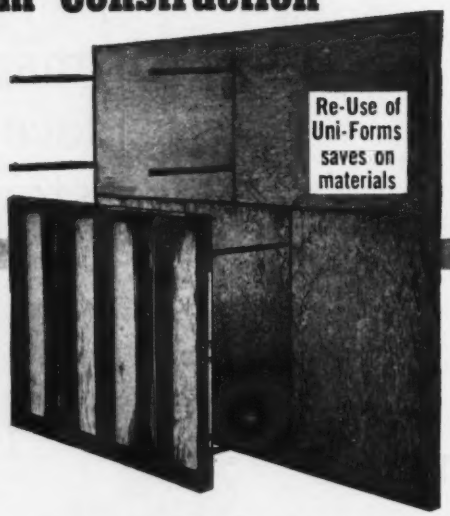

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MEETINGS

NATIONAL SAFETY COUNCIL, 32nd annual Safety Congress, 20 North Wacker Drive, Chicago, Ill., Oct. 5-7.

AMERICAN PUBLIC HEALTH ASSOCIATION, wartime conference and 72nd annual business meeting, Hotel Pennsylvania, N. Y., Oct. 12-14.

AMERICAN WELDING SOCIETY, 24th annual meeting, Hotel Morrison, Chicago, Ill., week of Oct. 18.

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT, 11th annual meeting, American Society of Civil Engineers, 33 West 39th St., New York, N. Y., Oct. 23.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, Hotel Sherman, Chicago, Ill., Oct. 21-23.

AMERICAN PUBLIC WORKS ASSOCIATION, Hotel Sherman, Chicago, Ill., Oct. 24, 25, 26 and 27.

REGIONAL AND LOCAL MEETINGS

NEW ENGLAND WATER WORKS ASSOCIATION, Hotel Statler, Boston, Mass., Sept. 28-29.

NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE, Grand Forks, N. D., Oct. 5-7.

SOUTHWEST SECTION, WATER AND SEWAGE WORKS MANUFACTURERS ASSOCIATION, INC., Oklahoma City, Okla., Oct. 11-13.

MISSOURI VALLEY SECTION, AMERICAN WATER WORKS ASSOCIATION, Des Moines, Iowa, Oct. 12-15.

NEW JERSEY SECTION, AMERICAN WATER WORKS ASSOCIATION, joint meeting with Four-States Section, Benjamin Franklin Hotel, Philadelphia, Pa., Oct. 14-16.

WISCONSIN SECTION, AMERICAN WATER WORKS ASSOCIATION, Milwaukee, Wis., Oct. 19-20.

CALIFORNIA SECTION, AMERICAN WATER WORKS ASSOCIATION, Biltmore Hotel, Los Angeles, Calif., Oct. 27-29.

CANADIAN INSTITUTE ON SEWAGE AND SANITATION, annual convention, General Brock Hotel, Niagara Falls, Ont., Oct. 28-29.

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
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WATER SUPPLY

PROPOSED WORK

Ill., Marion—H. L. Crisp., mayor, waterworks, addns., imprvs. $64,800. **FWA.**

★**Mo., St. Louis**—Bd. P. Serv. City Hall, 12 and Market Sts., Zone 3, new boiler house and smokestack at Chain of Rocks pump station on Mississippi River, $975,000; addnl. water storage reservoir at Stacey Park, St. Louis Co., $1,500,000; installing addnl. pump. units at Howard Bend pump. station on Missouri River $350,000.

Pa., Midland—Midland Water Co., Midland, 2 mi. 14 in. c.i. watermain from Midland, Pa. to Ohio-Pennsylvania border. $80,000.

S. D., Sioux Falls—Water sys. imprvs., incl. pipe changeovers at pump. station, $37,741; 2 new wells, $75,000. Perkins & McWayne, 322 Paulton Bldg., archts. Burns & McDonnell Eng. Co., 107 Linwood Blvd., Kansas City, Mo., engrs.

Tenn., Memphis—Bd. Memphis Light, Gas & Water Comn., c/o Maj. T. H. Allen, div. pres., 179 Madison St., expansion Sheahan, and N. Parkway Pumping Stations. $375,000.

†**Tex., Houston** — Harris Co. Fresh Water Supply Dist. 14, water sys., Tex. 41-498, $132,000. **FWA.** Garrett Engineering Co., 1806 Milam St., engrs.

BIDS ASKED

Bids Asked September 4

Mo., St. Charles—City, c/o W. G. Oelklaus, water supt., St. Charles, 1 m. g. tank for water sys. $50,000 W Haltman, 101 S. Main St., engr.

Bids Asked September 8

Tex., Ft. Worth—S. H. Bothwell, city mgr., furnishing two 15 m. g. p. d. pumping units for Holly pump. station. Plans deposit $10. Freese & Nichols, Capps Bldg., engrs.

Bids Asked About September 10

†**N. C., Elizabeth City**—Federal Works Agency, 601 State-Planters Bank Bldg., Richmond, 19, Va., addnl. waterworks facilities, incl. 17,000 ft. 12 in. c.i. water supply lines, pump. station, installing 2,100 GPM lowhead transfer pump, rein.-con. reservoir cover. $91,761. Peirson & Whiteman, Raleigh, consulting engrs. CD 5/18—ENR 5/20.

Bids Asked September 13

Que., St. Johns—H. Morais, city clk., exten. filtration plant. $50,000. E. Gaudette, city engr.

Bids Asked September 14

Ill., Chicago—City, Dpt. P. Wks., O. E. Hewitt, comr., City Hall, furnishing, del., installing pumps and piping, incl. traveling crane for South Dist. Filtration Plant, E. 79 St., Lake Michigan. Plans deposit $15; adv. ENR 8/26.

LOW BIDDERS

★**Calif., San Diego**—California Water & Telephone Co., 19 W 9 St., National City, Aug. 14, concrete arch dam across Sweetwater River, from L. E. Dixon Co., 609 S. Grand Ave., Los Angeles, **$1,114,447.** CD 7/27—ENR 7/29.

†**Mo., Neosho**—City, G. Woods, mayor, City Hall, Aug. 12, WW imprvs., Part 1, 2 brick pump houses, 1 brick booster pump house, rein.-con. reservoir, 2 booster pumps, furnishing, laying watermains, etc., from D. P. Gray, Monett, **$43,400;** Part 2, drilling, casing cementing, testing 2 deep water wells, furnishing, installing 2 deep well turbine pumps, controls, etc., from Layne-Western Co., 1010 W. 39 St., Kansas City, Mo., **$22,900. FWA.** CD 8/3—ENR 8/5.

†**Mo., Neosho**—G. Woods, mayor, Aug. 12, main extens., from Aspiund Constr. Co., Box 951, Enid, Okla., **$34,635.**

CONTRACTS AWARDED

Calif., San Francisco—Pub. Utilities Comn., City Hall, 300,000 gal. concrete tank on Forest Hill, Spec. 350, to De Luca & Son, 1745 Gilbert St., San Francisco, **$20,630.** CD 8/16—ENR 8/19, under LB.

†**Florida**—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, water and sewage facilities, Neg-Jax-44-107, Lee Co., to Langston Constr. Co., 29 S.E., 5 St., Miami, under **$50,000.**

†**Florida**—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, water distr. lines, concrete sewer pipe, etc., Contr. 436-Eng-10527, Washington Co., to Gabel Constr. Co., 218 Graham Bldg., Jacksonville. Approx. **$20,000.**

†**Florida**—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, water service pits, Neg-Jax-43-1145, Palm Beach Co., to Clarence Gaston, West Palm Beach, under **$50,000.** Awarded 8/16.

Location of ENR Correspondents

Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect-Engineer-Management type of contract

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply	Unclassified
Sewers, Waste Disposal	Latin America
Bridges	Public Buildings
Streets & Roads	Commercial Buildings
Earthwork, Waterways	Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR); LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Minn., St. Paul—North Dale sewerage sys., from Feyan Constr. Co., 408 Atwater St., **$76,680.**

†**Mo., Dixon**—City, c/o City Clerk, sewers. **FWA** 23-267. $54,000.

†**N. Y., Rotterdam**—Sewer Dist. 2, exten., imprv. sewage disposal sys., approx. 9,330 lt. 8 and 10 in. sewers and 3,550 ft. 5 in. service laterals, sludge beds, sludge tank with piping, appurtenances, $25,160 **FWA** allot.

†**N. Y., Salina**—Mattydale Sewer Dist., completing sanitary sewerage sys., 18,310 ft. 6- to 10-in. sewers, house laterals, manholes, appurtenances $113,640. **FWA.**

BIDS ASKED

Bids Asked September 10

Md., Hyattsville — Washington Suburban Sanitary Comn., Hamilton St., 10,820 2-to 15-in. vitr. sewers, and 1,570 ft. 6 in. vitr. sewer house connections, Contr. 147-S, H. R. Hall, Hyattsville, ch. engr. adv. ENR 8/26.

LOW BIDDERS

Calif., San Francisco—Dpt. P. Wks., City Hall, Aug. 18, sewers, appurtenances in 15 and Church Sts., Sys. Sect. A, plain concrete, from Healy-Tibbits Constr. Co., 1100 Evans Ave., San Francisco, **$108,422.** CD 8/12.

CONTRACTS AWARDED

Ill., Moline—Exten. storm drain and sanitary sewerage sys., to Phelan Constr. Co., Lane Bldg., Davenport, Ia., and Lockhart Heating & Plumbing Co., 410 16 St., **$25,000.**

Contract Awarded

†**Louisiana**—Pendleton Shipyard Co., Inc., Masonic Temple, New Orleans, sewerage sys., with pump. station, bldgs., to Boh Bros. Constr. Co., 2400 Cypress St., New Orleans, **$54,136.** Federally financed. Bids 7/24. CD 8/2—ENR 8/5, under LB.

BRIDGES

PROPOSED WORK

Mont., Great Falls — Cascade Co., Court House, two 100 ft. span bridges, $50,000.

BIDS ASKED

Bids Asked August 31

Arkansas—State Hy. Dpt., J. H. Crain, chm., Little Rock, rein.-con. deck girder bridge, grading, drainage structures, concrete paving 0.295 mi. Sebastian Co., W. W. Mitchell, Little Rock, state hy. engr.

CONTRACTS AWARDED

Que., Montreal—Canadian National Rys., H. A. Dixon, ch. engr., 360 McGill St., subway over Wellington St., to Kennedy Constr. Co., Ltd., McGill St.; subway over D'Argemon St. to Billie Constr. Co., Ltd., 1440 Ste. Catherine St.

STREETS AND ROADS

BIDS ASKED

Bids Asked August 31

Arkansas—State Hy. Dpt., J. H. Crain, chn., compacted roadbed and traffic service gravel surfacing 5.09 mi. Hy. 8, Ashley Co. W. W. Mitchell, Little Rock, state hy. engr.

Bids Asked September 17

Ill., Chicago—Oscar E. Hewitt, comr., P. Wks., City Hall, Chicago, concrete paving, South Union Ave., W. 33 to W. 28 Sts. Plans deposit $10.

N. Y., New York—President Bronx Boro, Bronx County Bldg., 851 Grand Concourse, repairing sidewalks, erecting guard rails, etc., where necessary E. 146 St. in front various properties W. 231 and Corlear Ave., etc.

Pennsylvania—Office J. U. Shroyer, secy. Hys., Harrisburg, widening existing pavement with crushed aggregate base, new base surfacing with bituminous surface, existing concrete bridge exten. and surfacing and existing bridge floor 5,465 ft. Ro.. gislative R-463, Sec. 2, Traffic R-332, Buc.. Co.

Bids Asked September 3

Minnesota—State Hy. Dpt., St. Paul, crushed rock base 10.8 mi. road between Plainview and 2 mi. south of Kellogg, S.P. 7901-22 (Trunk Hy. 42-42). Over **$35,000** (unofficial). Plans deposit 55c. G. L. Kipp, ch. engr.

Bids Asked September 8

California—State Div. Hy., Sacramento, 3.5 mi. imported borrow and plant mix surfacing to be placed bet. surf and Lynden School, Santa Barbara Co.; grading, concrete and asphaltic concrete, paving 0.25 mi. 22 St. between Peralta and Wood Sts., Alameda Co.; road mix surfacing 6.8 mi. between San Andreas and Angels Camp, Calaveras Co. G. T. McCoy, Pub. Wks. Bldg., Sacramento, engr.

Bids Asked September 9

New Jersey—Bd. Freeholders, Hudson Co., Court House, general repairs, imprvs. roads, F. Radigan, Court House, Jersey City, engr.

N. Y., Albany—Superintendent Pub. Bldgs., Albany, repairing pavement in Central Court, Spec. 11714.

Bids Asked September 10

California—State Div. Hy., Sacramento, grading, plant mix surfacing 3.3 mi. Etiwanda Ave. between Mission and Valley Blvds., Riverside and San Bernardino Counties. G. T. McCoy, Pub. Wks. Bldg., Sacramento, engr.

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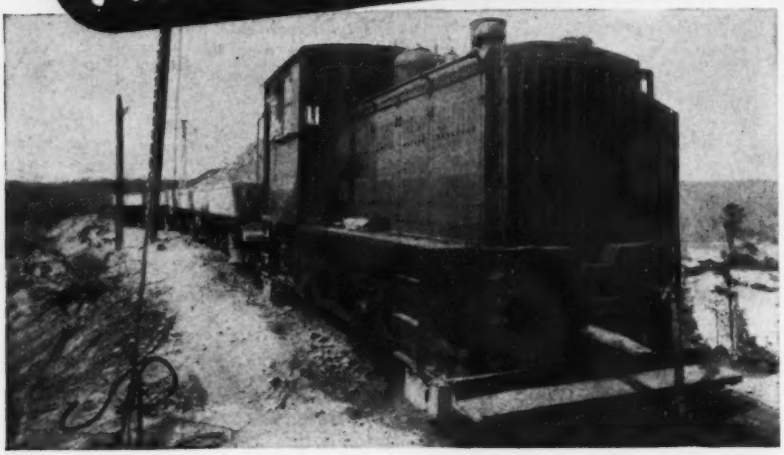

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STREETS AND ROADS (Bids Asked, Cont'd.)

Bids Asked September 17

†**O., Dayton**—Veterans' Admin., Vermont Ave. between H and I Sts. N.W., Wash., D. C., surface treatment, Proj. No. 2162.

Bids Asked

Kentucky—Dpt. Hys., Frankfort, rejected bids, bituminous surfacing 2 mi. Catlettsburg-Louisa Rd., SP 10-95 Part 3, Boyd Co. CD 8/17—ENR 8/19 under LB.

Washington—State Hy. Dpt., Olympia, rejected bids Aug. 17, imprv. 52.3 mi. Grant and Douglas Counties, 0.426 mi. Pierce Co. CD 8/3—ENR 8/5.

Ont., St. Thomas—Secy. Dpt. Munitions & Supply, Ottawa, resurfacing road and apron at parade grounds, No. 1 Technical Training School, on Hy. 4, for Dpt. Natl. Defense (Air), Ottawa. About $70,000.

LOW BIDDERS

Arizona—State Hy. Comn., Phoenix, Aug. 10, imprv. 5.1 mi. Sonoyta-Ajo Hy., F.L. 18-A (2) (1942) AFE. 683, from Tanner Constr. Co., 731 N. 19 Ave., Phoenix, **$107,529.** CD 8/5.

†**Arizona**—Pub. Roads Admin., New Post Office Bldg., Phoenix, Aug. 17, bituminous treatment approx. 22.722 mi. Pima Co., from N. G. Hill, Box 551 Phoenix, **$43,033.** CD 8/9.

California—State Div. Hys., Sacramento, Aug. 18, imprv. 1.3 mi. Alameda Co., from Lee J. Immell, Box 65, Sta. A, Berkeley, **$91,926*****1.2 mi. Fresno and Merced Counties, from Brown, Doco & Baun, Box 23, Pismo Beach, **$32,889*****3.9 mi. Alameda Co., and 1.5 mi. San Joaquin Co., from Louis Biasotti & Son, P. O. Box 587, Stockton, **$94,342** and **$41,239,** respectively. CD 7/30—ENR 8/5.

California—State Div. Hys., 808 State Bldg., Los Angeles, Aug. 12, imprv. 4.4 mi. Ventura Blvd., Los Angeles and Ventura Counties, from Schroeder & Co., Inc., 8140 Tujunga Ave., Roscoe, **$31,372.** CD 7/22—ENR 7/29.

†**California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, Aug. 13, paving, No. 142, Los Angeles Co., from Griffith Co., 502 Los Angeles Railway Bldg., Los Angeles, **$20,000-$30,000.**

Ill., Chicago—Dpt. P. Wks., O. E. Hewitt, comr., City Hall, Aug. 13, concrete paving S. Jefferson St., W. 15 St. Pl. to W. Roosevelt Rd., from Leininger Constr. Co., 20 N. La Salle St., Chicago, **$86,758.** CD 8/9.

Maryland—State Roads Comn., Baltimore, Aug. 17, imprv. 1.626 mi. Washington Co., from Thomas, Bennett & Hunter, Westmins-

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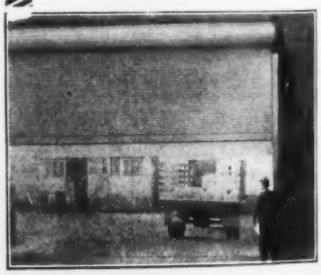

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STREETS and ROADS (Low Bidders, Cont'd.)

ter, $80,499; 1.331 mi. Prince Georges and Anne Arundel Counties, from E. J. Langenfelder & Sons, Rosedale, **$171,998.** CD 8/11.

Nebraska—State Dpt. Rd. & Irr., Lincoln, Aug. 12, imprv. 7.7 mi. Fairmont-York, from Roberts Constr. Co., 1018 Term. Bldg., Lincoln, **$98,213;** imprv. DA-WI-17, Sarpy Co., from Peter Kiewit Sons & Co., Omaha Natl. Bk. Bldg., Omaha, Neb.; and Big Horn Constr. Co., Sheridan, Wyo., **$57,174.** CD 8/3—ENR 8/5.

Wash., Seattle—Port of Seattle, Bell St. Terminal, Zone 1, Aug. 11, repaving track section in E. Marginal way at Stacy-Lander, Hanford and Spokane St. Terminals, from General Constr. Co., 3840 Iowa St., Zone 6, **$28,600.**

CONTRACTS AWARDED

California—State Hy. Div., Sacramento, grading crusher run base and placing armor coat 3.9 mi. Reed Rd. and Tiburon Blvd., between State Hy. Route 52, and 4 mi. easterly in Dist. 4, Marin Co., to Healy-Moore Co., 344 High St., Oakland, **$121,940.** G. T. McCoy, Pub. Wks. Bldg., Sacramento, engr.

†Florida—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, roads, Contr. 436-eng-10544, Polk Co., to Cleary Bros. Constr. Co., West Palm Beach, **$100,000.**

Idaho—Dpt. P. Wks., Boise, sealing 13.639 mi. U. S. 93, 22.9 mi. U. S. 30 between Murtaugh and Burley, etc., Misc. Projects 1225, 1226, 1228, 1231, Lincoln, Jerome, Twin Falls and Cassia Counties, to Triangle Constr. Co., 1707 Crescent Rim Dr., Boise, **$24,460.** Est. $34,520. Bids 8/13.

Idaho, Boise—State Hy. Dpt., Boise, imprv. 5.579 mi., DA-RM-No. 44, Blaine Co., to Hoops Constr. Co., Twin Falls, **$35,389.** Bids 8/20. CD 8/17.

†Maryland—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., grading, paving, to Ligon & Ligon, 3310 Ridgewood Ave., Baltimore, **$80,000.** Perring & Remington, 10 W. Chase St., Baltimore, engrs.

Md., Baltimore—Bd. Awards, City Hall, concrete paving alleys, Contr. WCC 161, to Paramount Constr. Co., 3700 Gough St., **$39,122.** Bids 8/4. CD 8/10—ENR 8/12, under LB.

†Massachusetts—U. S. Eng., 31 St. James Ave., Boston, grading, No. 19-023-44-Neg-14, Barnstable Co., to M. DeMatteo Constr. Co., 71 Blue Hills Pkway., Milton, **$50,000-$100,000.**

Minnesota—State Hy. Dpt., St. Paul, imprv. S.P. 1803-04 (Trunk Hy. 18-18), and S.P. 4814-16 (Trunk Hy. 169-18), to Duininck Bros. & Gilchrist, Olivia, **$29,818;** S.P. 7312-04 (Trunk Hy. 55-142), S.P. 7313-03 (Trunk Hy. 55-142) and S.P. 7314-06 (Trunk Hy. 55-142), to DeRuyter Bros., Willmar, **$27,420.** Bids 7/16, awarded 8/6. CD 7/20—ENR 7/22.

†New Jersey—U. S. Eng., 6 and Walnut Sts., Phila., Pa., grading, paving, drainage, Contr. 697-eng-4882, Cumberland Co., to Union Paving Co., Phila., Pa., **$400,000.**

O., Cleveland—Bd. Comrs. Cuyahoga Co., G. H. Stahler, clk., imprv. 1,800 cu. yd. Mastick Rd., to Allied Corp., Keith Bldg., Cleveland, **$40,465.** Est. $41,650. Bids 8/10, awarded 8/13. CD 7/26—ENR 7/29.

Ore., Eugene—Lane Co., Court House, Eugene, resurfacing, widening 8 mi. road up Fall Creek from Lowell Rd., day labor, **$50,000.** P. M. Morse, City Hall, engr.

South Carolina—State Hy. Dpt., Columbia, hot laid sheet asphalt and binder course on Docket 42-263 Defense Access Project DA-WR 11-A (1) Parts 1, 2, 3, 4, State Route 9, Spartanburg Co., to Fred N. Thompson, Charlotte, N. C., **$266,813.** Bids 8/17. Awarded 8/17. CD 8/6—ENR 8/12.

Washington—R. Bantz, dir. State Hy. Dpt., Olympia, imprv. 42.3 mi. Clallam Co., to Peter Kiewit Sons, Northern Life Tower, Seattle, Zone 1, **$69,394.** Bids 8/10.

Washington—State Hy. Dpt., Olympia, imprv. 6.03 mi. Klickitat Co., to Nilson-Smith Constr. Co., Great Falls, Mont., **$139,130***** 6.5 mi. Yakima Co., to S. Birch & Sons Constr. Co., Great Falls, Mont., **$138,289***** 7.4 mi. Lewis Co., to L. Colucci, 512 21 Ave. S., Seattle, **$117,088***** 0.7 mi. Kitsap Co., to Paine & Gallucci & Harrison Bros., 1521 S. Grant St., Tacoma, **$64,001.** Grand total $457,508. Bids 817. CD 8/3—ENR 8/5.

Ont., Swansea—Village, laying 4,600 sq. yds. concrete base and approx. 23,000 sq. yds. asphalt resurfacing Riverside Dr., to Godson Contracting Co. Ltd., 203 Richmond St., W., Toronto, about **$35,000,** G. C. MacDonald, 15 Morningside Ave., engr.

EARTHWORK, WATERWAYS

PROPOSED WORK

Fla., Jacksonville—Huckins Yacht Co., F. P. Huckins, pres., 600 E. 4 St., 250x350 ft. yacht basin and mfg. and service facilities for yachts and small speedy craft. $250,000.

N. D., Linton—State of North Dakota, Long Lake-Kyes water proj. $105,000.

†Louisiana—Pendelton Shipyard Co., Inc., Masonic Temple, New Orleans, bulkheads, facilities for installation 1,000 ton drydock. Federally financed

★**Nebraska**—Platte Valley Water Assn., Grand Island, irrigation for 450,000 acres of land in Buffalo, Mall and Merrick Counties. Approx. $2,000,000. Richard F. Nosby, North Platte, engr.

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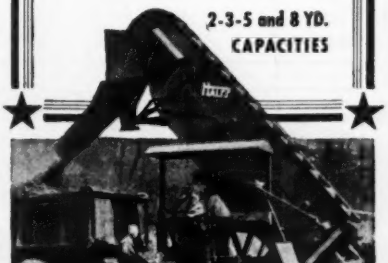

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EARTHWORKS (Proposed Work, Cont'd.)

Okla., Ponca City—L. A. Cann, city mgr., and C. E. Norton, city clk., preliminary sign, bids will be taken about 4 to 6 weeks raising widening Lake Ponca dam approx. 4 ft., paving portion of spillway, drainage of water from base of dam, etc. $127,340. Burns & McDonnell, 107 W. Linwood Blvd., Kansas City, Mo., engrs. CD 7/27—ENR 7/29 under BA.

BIDS ASKED

Bids Asked August 30

New York—Comr. Marine & Aviation, Pier A, foot of Battery Pl., North River, New York, reconstructing pier and bulkhead wall foot of 44 Dr. (Nott Ave.). Plans depos. $1.50.

Bids Asked August 31

Ark., Des Arc—J. H. Crain, chn. Ark. Hy. Dpt., Little Rock, bank protection on White River, on S. H. 38, near here.

Bids Asked September 7

†**Arkansas**—U. S. Eng., U. S. Post Office and Courthouse, Vicksburg, Miss., approx. 825,000 cu.yd. or 954,000 cu.yd. earthwork on south bank of Arkansas River, No. 22-052-44-4 and aprox. 292,000 cu. yd. or 327,000 cu.yd. earthwork on south bank of Arkansas River, No. 22-052-44-5.

†**Pennsylvania**—W. R. Hodder, project mgr., United Engineering & Foundry Co., Sherman St., New Castle, relocating channel of Neshannock Creek and other work, for DPW, adv. ENR 8/26.

Bids Asked September 8

New Jersey—At office State Bd. Commerce & Navigation, F. D. Holmes, dir. and secy., State House, Trenton, Zone 7, stone jetty, Delaware Bay, Project 190, Cape May Co.; timber bulkhead, timber pile crib and stone toe wall, Proj. 191, Monmouth Co.; adv. ENR 8/26.

Bids Asked September 10

†**Fla., St. Petersburg**—Office District Engineer Pub. Bldgs. Admin., FWA, 214-M Post Office, Federal Annex, Atlanta, 3, Ga., repairing seawall, etc., at Coast Guard Air Station.

Bids Asked September 15

†**Washington**—Bureau Reclamation, Yakima, earthwork, pipelines, structures, laterals 50.4 to 59.0 and sublaterals, and diversion channels, Mile 30.87 to Mile 37.80, Roza Div., Yakima Proj., Spec. 1057.

LOW BIDDERS

Calif., Ventura—Ventura Co., Court House, flood protection work along Santa Paula Creek from Santa Clara River north 1 1/4 mi., clearing channel, constructing purposes, from Rhoads Bros. & Shofner, 3869 Medford Ave., Los Angeles, **$42,600.**

†**Mississippi**—U. S. Eng., U. S. Post Office & Courthouse, Vicksburg, Aug. 16, 2,010,000 cu.yd. channel excav., Cassidy Bayou, Miss., AA-5, Quitman and Coahoma Counties, from J. A. Terteling & Sons, S. E. Long St., Columbus, O., **19c.** per cu.yd., total **$381,900.** CD 7/18—ENR 7/22.

†**Texas**—U. S. Eng., 25 St. and Avenue S, Galveston, Aug. 17, Brazos River flood gate, incl. 2 water wells, bldgs., Sol. 359-44-C5, Galveston Co., from H. N. Whitley, Constructn. Bldg., Dallas. Approx. **$70,000.** CD 8/12.

CONTRACTS AWARDED

†**Arkansas**—U. S. Eng., 300 Bway., Little Rock, 101,000 cu. yd. levee work, Holly Bend Levee, Pope Co., to F. S. Neely, Marks, Miss., **$30,000.** Awarded 8/10.

†**Illinois**—U. S. Eng., 816 U. S. Courthouse & Customhouse, St. Louis, 2, Mo., rebuilding levees, Monroe Co., repairing levees in Monroe and Randolph Counties, to Chern Constr. Co., 710 N. 12 Blvd., St. Louis, Zone 1. Est. under **$500,000** and **$100,000** respectively. Bids 8/12. CD 8/9.

†**Missouri**—U. S. Eng., 816 U. S. Courthouse and Customhouse, St. Louis, Zone 1, bank protection work and piling clump dikes on Mississippi River, to Patton-Tully Transportation Co., Box 1133, Memphis, Tenn., **$100,000.**

†**Rhode Island**—U. S. Eng., 819 Industrial Trust Bldg., Providence, dredging, maintenance Job 44-6, Newport Co., to Estate of Charles Heling, Lindenhurst, N. Y. Est. under **$50,000.** CD 8/5.

†**Texas**—U. S. Eng., Fort Sam Houston, flood protection, levees, embankments, etc., Brown Co., to Rex Kitchens Constr. Co., 608 W. Monroe St., Austin, approx. **$74,000.**

UNCLASSIFIED

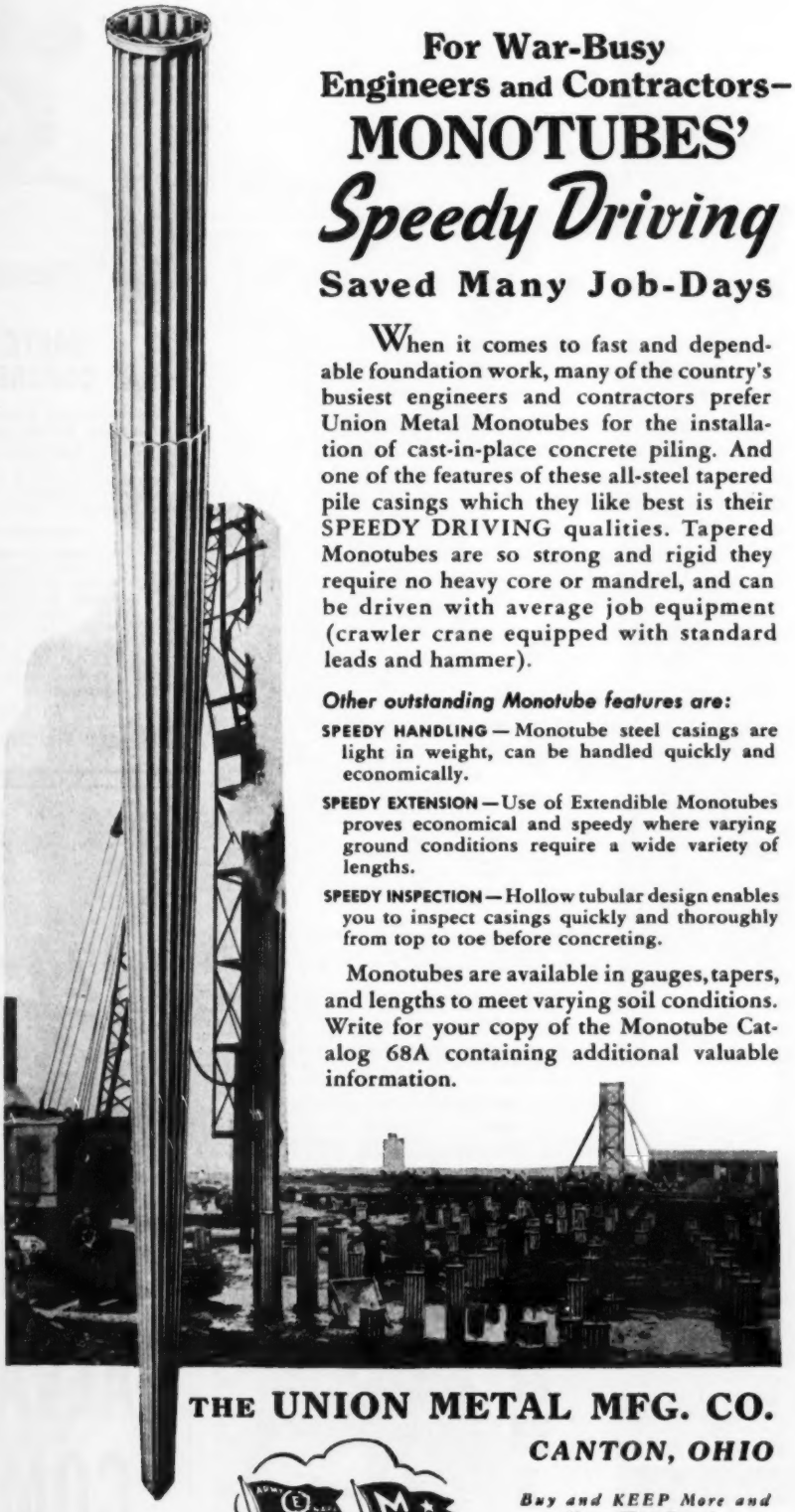
PROPOSED WORK

†**California** — SANITARY FACILITIES—U. S. Eng., 74 New Montgomery St., San Francisco, sanitary facilities, Job No. 1[illegible] central California.

†**Ky., McKee**—RURAL ELECTRIFICATION LINES—Jackson Rural Electric Cooperative Corp., McKee, completion section rural electrification sys. $54,000 REA allot.

†**Ky., Somerset** — RURAL ELECTRIFICATION LINES — South Kentucky Rural Electric Cooperative Corp., Somerset, completion section rural electrification transmission line sys. $40,000 REA allot.

Minnesota—RURAL ELECTRIC LINES—



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UNCLASSIFIED (Proposed Work, Cont'd.)

North Pine Electric Cooperative Inc., Finlayson, 61 mi. rural electric distribution lines Pine Co. $35,000 (unofficial).

†**Tex., Nederland**—IMPROVEMENTS—Jefferson Co., c/o Judge, Beaumont, bids soon imprvs., 2 story administration bldg., 1 story mechanical bldg. $225,000. Federally financed. Wignall & Neff, Port Arthur, and H. Woodside, Beaumont, archts. CD 7/26—ENR 7/29.

Tex., Wharton—OIL WELL—Edwin Neilson & Associates, River Oak Gardens, Houston, drilling, developing 7,000 ft. oil well.

BIDS ASKED

Bids Asked August 30

Mass., Lynn—RAIL SALVAGE—City Clerk, City Hall, removing 3,000 tons street car rails, etc., various streets. Bids Aug. 16 rejected. CD 8/19—ENR 8/26.

†**N. J., Woodbine**—AIRPORT—Civil Aeronautics Admin., LaGuardia Field, Jackson Heights, N. Y., airport imprvs.

N. Y., New York—TEST BORINGS—Manhattan Boro, Municipal Bldg., test borings in connection with sewer construction along W. 72 St., Madison Ave., E. 61, E. 74 and E. 79 Sts., Contr. 72; relaying granite block pavement in front Piers N. 2 and 3, Marginal St., north and south of Morris St.

Ont., Oshawa — IMPROVEMENTS — Dpt. Transport, Ottawa, addnl. development, clearing, drainage. About $35,000. Plans deposit $10.

Bids Asked August 31

N. Y., New York—RAILROAD TRACK WORK, etc.—Bd. Transportation, 250 Hudson St., renewal portions surface railroad track work, BMT Div. (agreement RC) and special track work, frogs and switch points, Bid 23706.

Bids Asked About September 6

★†**N. M., Artesia**—AIRPORT—Civil Aeronautics Admin., P.O. Box 1689, Fort Worth, Tex., airport, incl. clearing, excav., drainage, conditioning, seeding, etc. $1,000,000. Plans deposit $20. CD 8/5—ENR 8/12.

Bids Asked September 6

†**N. M., Hobbs** — IMPROVEMENTS — Civil Aeronautics Admin., P. O. Box 1689, Fort Worth, Tex., imprvs., grounds conditioning, seeding, etc. Extended date. Plans deposit $20. CD 8/9—ENR 8/12.

Bids Asked September 14

†**Alabama**—IMPROVEMENTS—U. S. Eng., Grant St. west of Westwood St., Mobile, imprvs., bldgs., electric, water and sanitary sewer distr. sys., Mobile Co. $40,000.

Bids Asked September 15

★†**Wis., La Crosse** — IMPROVEMENTS — Civil Aeronautics Admin., 608 S. Dearborn St., Chicago, Ill., imprvs. Over $500,000. J. H. Barth, city engr. CD 6/22—ENR 6/24.

Bids Asked September 16

†**Mississippi**—IMPROVEMENTS—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., imprvs., Hinds Co.

Bids Asked

†**Oklahoma**—IMPROVEMENTS—U. S. Eng., 416 Wright Bldg., Tulsa, Zone 2, imprvs., outdoor range facilities, Sol. 957-Neg-44-42, Muskogee Co. Over $25,000.

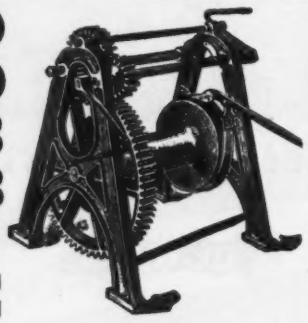
Tex., Terrell — IMPROVEMENTS — Terrell Aviation School, Terrell, imprvs., asphalt and concrete paving runways and taxiways. Over $25,000. Plans deposit $25. Koch & Fowler, Gr. Natl. Life Bldg., Dallas, engr.

Texas—CONSTRUCTION—U. S. Eng., Fort Sam Houston, addnl. construction, Bexar Co.

LOW BIDDERS

†**California**—TRANSMISSION LINE—Bureau of Reclamation, Redding, Aug. 16, 100 mi. 230 kilovolt transmission line from Shasta power plant to Oroville substation, Kennett Div., Central Valley Proj., Spec. 1056, from R. A. Wattson Co., 1026 N. McCadden Place, Los Angeles, $207,531. CD 7/23—ENR 7/29.

DOBBIE



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CLASSIFIED (Low Bidders, Cont'd.)

Parish, from Horton-Pollard, Bossier, $30,000. CD 8/16, under Roads.

Louisiana—IMPROVEMENTS—U. S. Eng., St. and Avenue F, Galveston, Tex., Aug. 16, prvs., storage facilities, Calcasieu Parish, Emmet Young, Inc., Lake Charles, prox. $40,000. CD 8/13.

Mass., Lynn—RAIL SALVAGE—City Clerk, Hall, Aug. 16, removing 3,000 tons street rails various streets, from Construction ts, Inc., 294 Washington St., Boston, 37c. lin. ft. CD 8/12—ENR 8/19.

Neb., Norfolk—AIRPORT, IMPROVE-MENTS—Civil Aeronautics Admin., 410 12 St., Kansas City, Mo., Aug. 16, airport, prvs., grading concrete and bituminous run-y from Platte Valley Constr. Co., Grand nd, $102,150 and $103,240 respectively*** crete runways, from Koss Constr. Co., 205 ney Bldg., Des Moines, Ia., $491,510*** nage, from Empire Contractors, Inc., 901 e St., Omaha, $53,363***combined grading, ways and drainage, from Booth & Olson d Green & Groesbeck, 622 Insurance Ex-nge Bldg., Sioux City, Ia., $638,991***bitu-ous runways, from Northern Improvement , Fargo, N. D., $366,246***combined bitu-ous runways project, from Peter Kiewit e Co., 1024 Omaha National Bank Bldg., naha, $645,708. CD 8/19, under LB.

Tex., El Paso—AIRPORT—Civil Aeronatics min., Dpt. Commerce, Box 1689, Fort rth, Aug. 20, airport imprvs., incl. clearing, ding, fencing, paving, conditioning, light-. Schedule 1, from Uvalde Constr. Co., 2027, Dallas, $71,780***Schedule 2, from Moor Contracting Co., Bassett Tower, El so, $346,320***Schedule 3, from Reynolds ctric Constr. Co., El Paso, $30,657. CD 8/9.

CONTRACTS AWARDED

Alabama—IMPROVEMENTS—U. S. Eng., nt St. west of Westwood St., Mobile, prvs., landing strip, taxiways, Contr. 569-5270, Dallas Co., to E. J. & W. L. Cobb, l Bldg., Montgomery, approx. $400,000.

Ariz., Nogales — IMPROVEMENTS—Civil ronautics Admin., 1500 Fourth St., Santa nica, imprvs., No. N-64-14, Schedule 1, A. Teichert & Son, P. O. Box 1113, Sacra-nto, Calif., $221,694; Schedule 2, to Tanner nstr. Co., 731 N. 19 Ave., Phoenix, $107,356. n 7/29. CD 8/4—ENR 8/12 under LB.

California—IMPROVEMENTS—U. S. Eng., New Montgomery St., San Francisco, prvs., Spec. 1026, central California, to rl N. Swenson Co., 355 Stockton Ave., San e. CD 8/3—ENR 8/5 under Public Bldgs.

California—IMPROVEMENTS—U. S. Eng., New Montgomery St., San Francisco, prvs., Spec. 1041, central California, to cific Builders, 312 East Alisal St., Salinas. 8/16—ENR 8/19.

California—RANGE—U. S. Eng., 74 New ntgomery St., San Francisco, range, Contr. -203-Eng-21, San Mateo Co., to C. H. Best Bldg. Co., Burlingame, $60,000.

Calif., Martinez—FERRY SLIP, etc.—Fer-Slip and approach trestle, at municipal rf, FWA, Calif. 4-462, to Macco Constr. 815 Paramount Blvd., Clearwater, $72,800. J. Walsh, 112 Market St., San Francisco, r. CD 8/5—ENR 8/12.

Florida—SKEET RANGES—U. S. Eng., Riverside Ave., Jacksonville, Zone 2, et ranges, Neg-Jax-44-103, Lee Co., to nge Constr. Co., Sarasota, under $50,000.

Florida—WYE TRACK—U. S. Eng., 575 verside Ave., Jacksonville, Zone 2, west of wye track, Neg-Jax-44-85, Hillsborough , to A. S. Wikstrom, Orlando, under $50,000. arded 8/12.

Florida — CLEARING, GRUBBING, etc. — S. Eng., 575 Riverside Ave., Jacksonville, e 2, clearing, grubbing, excav., stabiliza-, limerock base course, bituminous sur-

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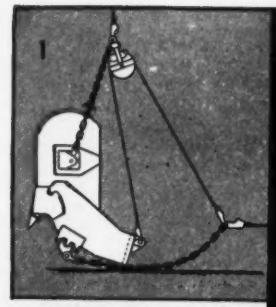

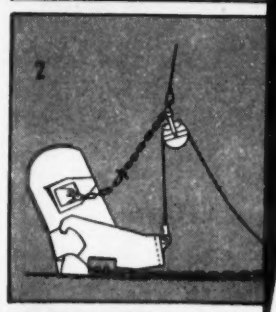

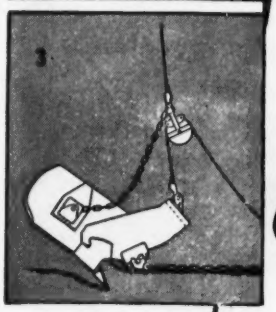

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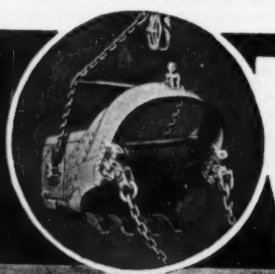

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

facing treatment, paving, etc., Contr. 416-Eng-10517, Washington Co., to B. B. McClerville, **$100,000.**

†Florida—FIRE ALARM SYSTEM—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, fire alarm sys., Neg-Jax-44-59, Dade Co., to American District Telegraph Co., 155-6 Ave., New York, N. Y., under **$50,000.** Awarded 8/6.

†Florida—TARGET RANGES—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, target ranges, Neg-Jax-44-72, Polk Co., to John Templain Lumber Co., Lakeland, under **$50,000.** Awarded 8/16.

†Fla., Jacksonville—WARM-UP PLATFORM EXTENSION—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave., N.W., Wash., D. C., warm-up platforms exten., NAAS, Lee Field, NOY 6875, to Brinson Constr. Co., 215 Madison St., Tampa, **$252,000.**

†Fla., Miami—HANGAR STEEL—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., structural steel for hangar, Miami Master Airport, NOY 6934, to Virginia Bridge Co., Roanoke, Va.

†Georgia—FACILITIES—U. S. Eng., Post Office Bldg., Savannah, facilities, Contr. 818-Eng-1624, Bibb Co., to Hallman Bros., Atlanta, approx. **$40,000.**

†Georgia—IMPROVEMENTS—U. S. Eng., 512 Spring St. N.W., Atlanta, imprvs., bldgs., Cobb Co., to Wesley Constr. Co., 441 Courtland St. N.E., Atlanta, under **$100,000;** bldgs., Cobb Co., to Ralph W. Didschuneit, Candler Bldg., Atlanta, under **$500,000.**

†Illinois—FACILITIES—U. S. Eng., Clock Tower Bldg., Rock Island, installing facilities, Contr. 741-Eng-4353, Rock Island Co., to Wadeford Electric Co., 205 W. Wacker Dr., Chicago, approx. **$60,000.**

†Ill., Great Lakes—SPRINKLER SYSTEM—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., sprinkler sys., prison and misc. bldgs., N. T. S. NOY 6871, to Automatic Sprinkler Corp. of America, 201 N. Wells St., Chicago, Ill., **$26,796.**

†Iowa—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, Neb., imprvs., Polk Co., to J. S. McLaughlin & Sons, 710 Walnut Bldg., Des Moines. Est. under **$100,000.**

†Kansas—IMPROVEMENTS—U. S. Eng., 10 E. 17 St., Kansas City, Mo., imprvs., wash rack, Finney Co., to H. L. Matthews Dodge City. Est. under **$50,000.**

†Kansas—IMPROVEMENTS—U. S. Eng., 10 E. 17 St., Kansas City, Mo., imprvs., wash rack, Ford Co., to H. L. Matthews, Dodge City. Est. under **$50,000.**

†Kentucky—FACILITIES—U. S. Eng., 306 U. S. Courthouse, Nashville, addnl. facilities, Contr. 40-058-Eng-77, Trigg and Christian Counties, to Gardner Constr. Co., McGavock Lane, Nashville, Tenn., approx. **$80,000.**

†Louisiana—FACILITIES, etc.—U. S. Eng., 300 Bway., Little Rock, Ark., facilities, road, drives, parking areas, Contr. 777-Eng-2112, Rapides Parish, to Dixie Constr. Co., 209 Ward Bldg., Shreveport, approx. **$80,000.**

†Maryland—IMPROVEMENTS—U. S. Eng., First and Douglas Sts. N.W., Wash., D. C., imprvs., bldg., Harford Co., to Charles H. Tompkins Co., 907 N.W., 16 St., Wash., D. C., **$300,000.** Bids 8/11.

†Massachusetts — IMPROVEMENTS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., imprvs., bldg., to R. R. Jacobucci, Inc., 28 Dayton St., Quincy, **$63,950.** CD 7/7.

†Massachusetts — ELECTRICAL WORK — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., electrical work for imprvs., bldgs., Barnstable Co., to Liberty Electric Co., 49 Weybosset St., Providence, R. I. CD 8/18.

†Massachusetts—FACILITIES—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., facilities, Contr. 699-eng-2476, Bristol Co., to John Bowen Co., 129 Newberry St., Boston, **$200,000.**

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NCLASSIFIED (Contracts Awarded, Cont'd.)

Mississippi—RANGE FACILITIES—U. S. Grant St. west of Westwood St., Mobile, range facilities, Harrison Co., to B. L. Pass Christian, under **$213,000.**

Nebraska—IMPROVEMENTS—U. S. Eng., Jackson St., Omaha, imprvs., concrete Buffalo Co., to Rentiar Co., Kearney.

N. J., Atlantic City—AIR STATION MAGINES, etc.—Yards & Docks, Navy Dpt., St. and Constitution Ave., N.W., Wash., C., magazines, access roads, fences, Naval Station, NOY 6474, to Ole Hanson, 7215 lantic Ave., Ventnor City, **$87,463.**

N. J., Cape May—ELECTRIC DISTRIBUTION SYSTEM—Yards & Docks, Navy Dpt., St. and Constitution Ave. N.W., Wash., C., underground electric distr. sys., Naval NOY 6346, to W. V. Pangborne & Co., Hagerstown, Md., **$84,425.**

New York — FACILITIES — U. S. Eng., Bldg., Syracuse, facilities, Contr. 321-Chemung Co., to Bero Engr. & Corp., Orchard Park Rd. and W. St., Buffalo, **$100,000.**

N. Y., Iona Island—RAILWAY TRACK—& Docks, Navy Dpt., 18 St. and Con-Ave. N.W., Wash., D. C., addnl. track work, N.A.D. NOY 6599, to Contracting, Inc., Hastings-on-Hudson, 75.

N. Y., Montauk—TORPEDO TESTING GE—Yards & Docks, Navy Dpt., 18 St. Constitution Ave. N.W., Wash., D. C., edo testing range, NOY 7311, to P. T. Constr. Co. & Spearin, Preston & Bur-Inc., 270 Bway., New York, Zone 7. 5/6.

North Carolina—FACILITIES—U. S. Eng., Customhouse, Wilmington, facilities, Contr. Eng-1910, Durham Co., to Lee Constr. 422 S. Church St., Charlotte, approx. 00.

North Carolina—IMPROVEMENTS—U. S. 308 Customhouse, Wilmington, imprvs., ht lighting, Iden. 982-44-7, New Hanover to Seastrunk Electric Co., 2740 Normandy Charlotte, under **$50,000.** Bids 8/15. 8/10.

North Carolina—SWIMMING FACILITIES U. S. Eng., 308 Customhouse, Wilmington, imming facilities (clearing and dam), n. 982-44-5, Granville Co., to Lee Constr. 422 S. Church St., Charlotte, under 00. Bids 7/31.

Ohio—IMPROVEMENTS—Goodyear Air-craft Corp., Airport, Akron, imprvs., to rge A. Fuller Co., 597 Madison Ave., New rk, N. Y. 22st. **$2,000,000.** Defense Plant p. will finance. CD 8/12—ENR 8/10.

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

Eng., 231 W. Main St., Denison, Tex., steel control towers, Comanche Co., to Bowers & Lundgren, Lawton, under **$50,000.**

†**Oklahoma**—RUNWAY END ZONE CLEARANCE—U. S. Eng., 416 Wright Bldg., Tulsa, runway end zone clearance, Contr. 957-eng-1714, Oklahoma Co., to Otha B. Cook, ta Cook Constr. Co., 6712 Wofford St., Dallas, **$30,000.**

†**Oregon** — FACILITIES — U. S. Eng., 628 Pittock Blk., Portland, addnl. military facilities, Deschutes Co., to Robertson, Hay & Wallace Co., 1801 S.W. Grand Ave., Portland, **$27,000.** Awarded 8/17.

†**Pa., Phila.**—FIRE ALARM SYSTEM, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., fire alarm and watchman's patrol sys., Aviation Material Storehouse, NOY 6749, to Electric Constr. Co., Broad St. Station Bldg., Phila., **$54,150.**

†**Pa., Phila.**—FUEL STORAGE FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., fuel storage facilities, NOY 6144, to Golder Constr. Co., Market St. National Bank Bldg., Phila., **$49,307.**

†**South Carolina**—CLEARING, etc.—U. S. Eng., 33 Customhouse, Charleston, clearing, grubbing, excav., and temporary bldgs., Contr. 231-Eng-1565, Charleston Co., to Charleston Constructors, Inc., Adgers Wharf, Charleston, approx. **$30,000.**

†**Texas**—FACILITIES—U. S. Eng., 231 W. Main St., Denison, facilities, Contr. 257-Eng-2461, Lamar Co., to Campbell & Kay, Tyler, approx. **$90,000.**

†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, imprvs., bldgs., Webb Co., to H. B. Zachry Co., P. O. Box 596, San Antonio, approx. **$25,000.**. Bids 8/13. CD 8/10.

†**Texas**—CONSTRUCTION—U. S. Eng., 231 W. Main St., Denison, addnl. construction, Contr. 257-eng-2480, Lamar Co., to R. J. Bell, Kilgore, **$30,000.**

†**Texas**—HARD SURFACE AREA, etc.—U. S. Eng., Fort Sam Houston, hardsurface area and hard standing area, Bell Co., to D. Word, 2215 Belknap Pl., San Antonio, under **$50,000.**

†**Texas**—RUNWAYS, etc.—U. S. Eng., 231 W. Main St., Denison, addnl. runways, taxiways, Contr. 257-eng-2479, Hunt Co., to Vilbig Constr. Co., 817 Bourbon St., Dallas, **$200,000.**

†**Texas**—TRAINING AIDS—U. S. Eng., 231 W. Main St., Denison, training aids, Contr. 257-eng-2477, Potter Co., to R. B. Butler and L. J. Miles Constr. Co. Roaring Springs Rd., Fort Worth, **$70,000.**

Tex., Anahuac—OIL WELL—Standard Oil Co. of Texas, Pet. Bldg., Houston, drilling, casing, developing new deep test oil well, to Rowan Drilling Co., Commerce Bldg., Houston, approx. **$25,000.**

†**Tex., Corpus Christi**—WARM-UP PLATFORM EXTENSION, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave., N.W., Wash., D. C., exten. warm-up platform and taxiways, N. A. S., NOY 6547, to Brown & Root, Inc., Corpus Christi, **$83,000.** CD 7/20.

Tex., Fannett—OIL WELL—Rowan Drilling Co., Commerce Bldg., Houston, oil well, 4½ mi. southeast of here, force account, **$25,000.**

Tex., Gregory—OIL WELL—Al Buchanan & Assoc., Milam Bldg., San Antonio, drilling, casing, developing oil well. Owner builds. **$25,000.**

Tex., Hull—OIL WELL—Gulf Oil Corp., Gulf Bldg., Houston, dup. test oil well, to Housh & Thompson Drilling Co., Gulf Bldg., Houston, approx. **$25,000.**

Tex., Katy—OIL WELL—J. B. Hawley & Associates, 912 College St., Ft. Worth, developing oil well, to Housh & Thompson Drilling Co., Gulf Bldg., Houston, approx. **$25,000.** CD 8/4—ENR 8/19.

Tex., Katy—OIL WELL—Humble Oil & Refining Co., Humble Bldg., Houston, drilling, developing oil well, to Housh & Thompson Drilling Co., Gulf Bldg., Houston, approx. **$25,000.** CD 5/4—ENR 6/6.

Tex., McAllen—OIL PIPELINE—Rado Refining Co., c/o C. J. Holland, pres., McAllen,

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

5 mi. 6 in. crude oil pipeline carrier, force account, **$50,000.** CD 8/11—ENR 8/19.

Tex., McAllen—PIPELINES—Radio Refining Co., McAllen, 75 mi. or more gathering pipelines radiating from 5 oil field and connecting with Conoco Main Line Carrier, purchase and hire method, approx. **$110,000.** CD 8/11—ENR 8/19.

Tex., Texas City—STORAGE TANKS—Republic Oil & Refining Co., Texas City, repairing, reconstructing 6 steel storage tanks, purchase and hire method, **$110,000.** CD 8/5—ENR 8/19.

†**Vermont**—IMPROVEMENTS—U. S. Eng., 31 St. James St., Boston, Mass., imprvs., access roads, etc., No. 43-212, Olean Co., to B. A. Simeone, Inc., North Clarendon. Est. $100,000-$500,000. Bid 7/20.

†**Vt., Burlington**—AIRPORT—Civil Aeronautics Admin., La Guardia Field, Jackson Heights, N. Y., airport, paving 2 taxiways. Proposal 13-546, to Bayer & Mingolla, P. O. Box 295, New Bedford, Mass. **$75,988.** CD 7/19—ENR 7/22.

†**United States** — LOCOMOTIVE CRANE WEIGHT INDICATORS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 60 locomotive crane weight indicators, various yards, East Coast, NOY 7102, to Martin Decker Co., 3431 Cherry Ave., Long Beach, Calif. **$33,000.**

†**Virginia**—PETROLEUM GASOLINE SYSTEM—Pub. Housing Auth., NHA, Temporary Bldg., 2, 19 and D Sts. N.W., Wash., D. C., liquefied petroleum gasoline sys., VA. 44287 and 44290, to Modern Engineering & Service Corp., 416 Boush St., Norfolk, **$32,521.**

†**Washington**—FACILITIES—U. S. Eng., 800 Third Ave., Seattle, Zone 4, addnl. facilities (unspecified), Spokane Co., to Sound Constr. & Eng. Co., and Peter Kiewit & Sons, Northern Life Tower Bldg., Seattle, Zone 1. **$100,000.**

†**Washington**—RAILROAD TRACK, etc.—U. S. Eng., 800 Third Ave., Seattle, Zone 4, railroad track and spur, Spokane Co., to Sound Constr. & Engineering Co., and Ford J. Twaits, Northern Life Tower, Seattle, Zone 1, $65,000.

LATIN AMERICA

Mexico—President Manuel Avila Camacho, Senita de C. y O. P. Mexico, D. F., has ordered intensive port reconditionings at **Coatzcoalcos,** Vera Cruz and **Salina Cruz,** Oaxaca, terminals of the railroad that crosses the Isthmus of Tehuantepec, $1,750,000; Sinaoloa Govt., Palacio del Estado, **Culiacan,** plans bond issue to finance street reconditioning. $415,000.

PUBLIC BUILDINGS

PROPOSED WORK

†**Arizona**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., plans by Lescher & Mahoney, Title & Trust Bldg., Phoenix, family dwelling units, Ariz. 2326 and dormitory accommodations, Ariz. 2327. CD 8/11—ENR 8/19.

†**California**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, cancelled bids to have been opened Aug. 16, facilities structures serving Proj. Calif. 4404. Project cancelled.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, housing, Job No. 1066, central California.

†**Calif., Chester**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 40 family dwelling units, Calif. 4760.

†**Calif., Herlong**—Pub Housing Auth., NHA, 785 Market St., San Francisco, 360 family dwelling units, Calif. 4747.

†**Calif., Needles**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 150 dormitory units, Calif. 4758.

†**Calif., Oceanside**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 144 dormitory units for women, Calif. 4759.

†**Colorado**—Pub. Housing Auth., NHA, Clerks Bldg., 1006 Grand Ave., Kansas City, Mo., plans by T. H. Buell & Co., 730-14 St., Denver, family dwelling units and trailers.

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., plans by Hayden & Loomis, 175 Main St., Bristol, family unit housing, Conn. 6205. CD 7/27—ENR 7/29.

†**Conn., New London** — Federal Works Agency, 18 and F Sts. N.W., Wash., D. C., plans by F. S. Langdon, 240 State St., nurses training bldg.

†**Conn., Stratford**—W. H. Shea, town mgr., Town Hall, plans by F. S. Langdon, 240 State St., New London, 2 story, Birdseye School addn., FWA.

†**Conn., Waterbury**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., 140 family dwelling units, Conn. 6206.

†**Florida**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., plans by Drake & Fetner, Rogers Bldg., Jacksonville, dormitory units, Fla. 8217 and family dwelling units, Fla. 8218. CD 7/28—ENR 8/5.

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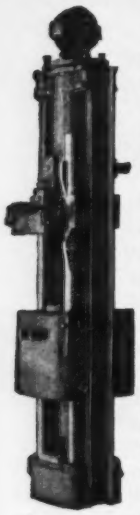

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

Fla., Jacksonville—Comr. Utilities, City Hall, Jacksonville, generating plant addns. $250,000. Burns & Roe, 233 Bway., New York, N. Y., engr.

†**Georgia** — Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, plans by Jas. J. W. Biggers and T. Firth Lockwood, Murrah Bldg., Columbus, family dwelling units, Ga. 9162. CD 7/28—ENR 8/5.

†**Georgia** — Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, postponed bids to have been opened Aug. 14, commercial bldg., housing Ga. 9131, Dennis & Dennis, Macon, archts. CD 8/10.

Ga., Atlanta—Ga. School Technology, c/o Dr. M. L. Brittan, pres., 225 North Ave. N.W., classroom bldg. and armory addn. $200,000.

★†**Iowa**—U. S. Eng., 1709 Jackson St., Omaha, Neb., bldgs., Page Co. $1,000,000.

★†**Iowa**—U. S. Eng., 1709 Jackson St., Omaha, Neb., bldgs., Algona Co. $2,000,000.

†**Mass., Falmouth**—Pub. Housing Auth., NHA, 24 School St., Boston, 100 family dwelling units, Mass. 19085; 100 trailers, Mass. 19086; and 150 dormitory units, Mass. 19087.

†**Mass., Lynn**—**Lynn Hospital**, 212 Boston St., plans by Stevens, Curtin, Mason & Riley, 45 Newbury St., Boston, 4 story, brick nurses home addn., service bldg., alterations. LY 5-2100, $150,000. **FWA.**

Miss., Biloxi—City, c/o G. Ditto, supt. Schools, Biloxi, plans by Collins & Darcey, Biloxi, 2 schools, one 174x185 ft. concrete block, and other 158x327 ft. and 77x94 ft. assembly hall, brick concrete blocks. $300,000. Applied for FWA funds.

†**New Mexico**—U. S. Eng., Albuquerque, bldg., facilities, Bernalillo Co.

†**N. Y., Olean**—Socony Vacuum Oil Co., 1103 Elk St., Buffalo, and Olean, crude oil refinery. $150,000. Defense Plant Corp. will finance.

†**N. C., Newbern-Morehead**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 500 family dwelling units, N. C. 31165.

†**N. C., Oteen**—Veterans' Admin., c/o Thos. G. Dodd, constr. mgr., hospital addns. $136,000.

N. C., Wilmington—Bd. Comrs., New Hanover Co., A. Hewlett, Jr., chn., Wilmington, plans by Lynch & Foard, 202½ Princess St., tuberculosis sanitorium. $150,000.

†**Ohio**—Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, brick, concrete synthetic rubber research laboratory. Over $150,000. Federally financed. J. Gordon Turnbull, 2630 Chester Ave., Cleveland, engr.

†**O., Sidney**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., hospital addn., Docket Ohio 33-248. **FWA.**

†**O., Lorain-Elyria**—Home Owners' Loan Corp., 209 W. 7 St., Cincinnati, 100 family unit conversion program.

S. D., Provo—Bd. Educ., plans by P. C. Bettenburg & Co., 1437 Marshall Ave., St. Paul, Minn., school addn., $157,300.

†**Utah**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., plans by Five Associates, engrs. and archts. Belvidere Hotel, Salt Lake City, temporary trailer units, Utah 42149.

†**Utah, Wendover**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 4 family dwelling units, Utah 42166.

†**Vt., Strafford**—Pub. Housing Auth., NHA. 24 School St., Boston, Mass., 40 family dwelling units, Vt. 43053.

†**Virginia**—Pub. Housing Auth., NHA, 19 and D Sts., N.W., Wash., D. C., plans by A. M. Lublin, Dickson Bldg., Norfolk, 40 dormitory units, Va. 44295 and 10 family dwelling units, Va. 44296, at Camp Pendleton.

Va., Newport News—City, J. C. Biggins, mgr., plans by Basil A. Pipino, Newport News, 5 story jail, 2 story police administration bldg. $300,000. Applied for FWA funds.

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

†**Washington**—Pub. Housing Auth., NHA, Skinner Bldg., Fifth Ave. and Union St., Seattle, Zone 1, plans by Stuart, Kirk & Durham, 4 and Cherry Bldg., Seattle, Zone 4, housing units, **Wash.** 45234. CD 8/5—ENR 8/19.

†**Washington**—Pub. Housing Auth., NHA, Skinner Bldg., Fifth Ave., Union St., Seattle, Zone 1, plans by D. J. Stewart, 222 Central Bldg., Vancouver, housing units, Wash. 45235. CD 8/2—ENR 8/19.

Wash., Ephrata—Grant Co. Hospital Assn., c/o V. E. Bjorklund, mayor, Ephrata, plans by G. W. Stoddard, Orpheum Bldg., Seattle, Zone 1, general hospital, $300,000.

†**Wash., Seattle**—Seattle School Dist. 1, 810 Dexter St., Zone 9, plans by F. A. Naramore & Assoc., Dexter Horton Bldg., Zone 4, addnl. school facilities, **FWA** Proj. 45259. $361,000.

★†**Wisconsin**—Ladish Drop Forge Co., 5405 S. Packard Ave., Cudahy, 1 story, 200x300 ft., rein.-con., brick, steel heat treating and processing bldg. Over $1,000,000, incl. equip. Defense Plant Corp. will finance. Klug & Smith Co., 111 E. Wisconsin Ave., Milwaukee, Zone 2, engrs.

†**Wisconsin**—U. S. Eng., 520 Merchandise Mart, Chicago, Ill., addnl. bldgs., utilities, Monroe Co.

BIDS ASKED

Bids Asked August 30

†**Maryland**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., dormitory units, Md. 18266; family dwelling units, Md. 18267; dormitory units, Md. 18268, and family dwelling units, Md. 18269, etc. F. L. W. Moehle & Assoc., 330 N. Charles St., Baltimore, archts. CD 8/10—ENR 8/12.

Bids Asked After August 30

†**New York**—Pub. Housing Auth., NHA, 270 Bway., New York, Zone 7, family dwelling units, NY 30170. Extended date. CD 8/5—ENR 8/12.

†**N. C., Goldsboro**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., Goldsboro Hospital Nurses Home, Docket 31-906, **FWA**, W. W. Hook, 1205 Commercial Bank Bldg., Charlotte, archt. CD 8/17—ENR 8/19.

†**N. C., Goldsboro**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., D. C., public health center bldg., Docket 31-238, **FWA**, A. J. Maxwell, Jr. 509 Borden Bldg., archt. CD 8/17—ENR 8/19.

Bids Asked September 1

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., family dwelling units, Conn. 6203, dormitory units, Conn. 6204 and community bldg. addn., Conn. 6081. Extended date. Plans deposit $50 first set, $10 for each addnl. set. Mylchreest & Reynolds, 236 Palm St., Hartford, archts. CD 8/19—ENR 8/26.

†**Ia., Knoxville**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., D. C., at Knoxville, addnl. 2 story, brick, rein.-con. hospital bldgs. CD 7/23—ENR 7/29.

N. Y., Brooklyn—Supt. Plant Operations & Maintenance, Bd. Educ., 13½ E. 12 St., New York, altering, repairing Brooklyn High School of Automotive Trades Annex (P.S. 147).

†**Tex., Fort Worth**—Federal Works Agency, 702 Electric Bldg., school bldg., Tex. 41-506F, for White Settlement School Dist. 37. Extended date. Plans deposit $10. A. B. Withers, Insurance Bldg., archt. CD 8/5—ENR 8/12.

Bids Asked September 2

†**Okla., Midwest City**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., school, $150,000, **FWA**. Extended date. Hudgins, Cobb, Thompson & Ball, 919 Cotton Exchange Bldg., Oklahoma City, archts. CD 7/20—ENR 7/22.

†**Wis., Beloit**—City Clerk or Perry W. Suern & Associates, archts., 19 S. La Salle St., Chicago, Ill., hospital addn., Wis. 47-123, $236,500. **FWA**. Plans deposit $15. CD 6/14—ENR 6/17.

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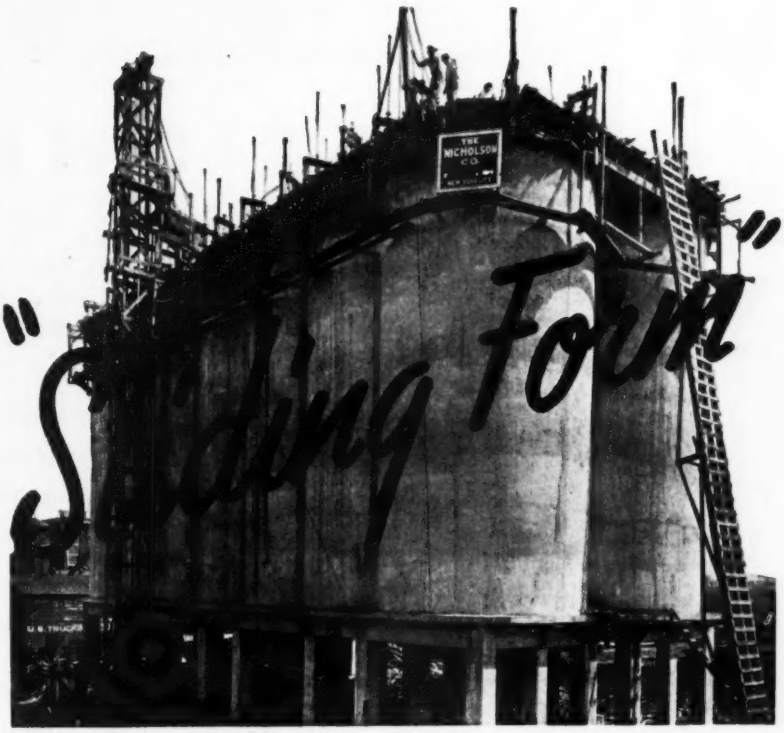

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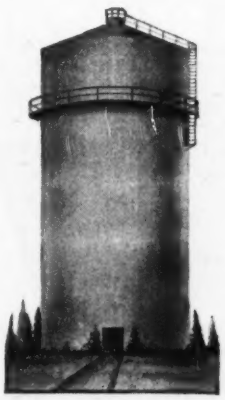

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

†**Nevada**—Pub. Housing Auth., NHA, 760 Market St., San Francisco, Calif., (selected list bidders) family dwelling units, Nev. 24012. C. F. Gromme, Albert Bldg., San Rafael, Calif., archt. CD 7/23—ENR 7/29.

Bids Asked September 3

†**Calif., Oceanside** — Dist. Engr., Federal Works Agency, Pub. Bldg. Admin., 568 M St., Latham Sq. Bldg., Oakland, Zone 12, alterations, etc., to recreation center, Proj. 4-487.

Bids Asked After September 3

†**Pennsylvania** — Allegheny Co. Housing Auth., Pittsburgh, community bldg., miscellaneous changes for housing Pa. 36171, for NHA. Plans deposit $20.

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York 7, N. Y., tenant activity bldg., site work for housing Pa. 36201, for Allegheny Co. Housing Auth., Pittsburgh. Plans deposit $20. CD 7/9—ENR 7/15.

Bids Asked September 4

†**Tex., Borger**—Pub. Housing Auth., NHA, E205 Electric Bldg., Seventh and Taylor Sts., Fort Worth, 60 family dwelling units, Tex. 41599 and 36 dormitory units, Tex. 41600. Tentative date. M. Lemmon, 1810 Tower Petroleum Bldg., Dallas, archt. CD 8/17.

†**Tex., Brownsville**—Pub. Housing Auth., NHA, 1205 Electric Bldg. Seventh and Taylor Sts., Fort Worth, 100 family units, Tex. 41598. Tentative date. Hedrick & Lindsey and L. C. Ellis, 818 Southern Standard Bldg., Houston, archt. CD 8/11—ENR 8/19.

Bids Asked September 6

†**Ky., Louisville**—Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, O., community bldg., Ky. 15021. Extended tentative date. E. G. Conrad, Hanna Bldg., Cleveland, O., archt. CD 7/21—ENR 7/29.

†**Ohio**—Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, community bldg., O. 33051. Extended tentative date. E. G. Conrad, Hanna Bldg., Cleveland, archt. CD 7/28—ENR.

†**W. Va., St. Albans**—Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, O., community bldg., W. Va.-46011. Extended tentative date. E. G. Conrad, Hanna Bldg., Cleveland, O., archt. CD 7/21—ENR 7/29.

Bids Asked September 7

†**Ind., Evansville**—Pub. Bldgs. Admin., 18 and F St. N.W., Wash., 25, D. C., hospital and nurses home, at Protestant Deaconess Hospital, Docket Ind. 12-181. **FWA**, Schmidt, Gorden & Erickson, 104 S. Michigan Ave., Chicago, Ill. archts. CD 4/30—ENR 5/6.

†**N. M., Fort Sumner**—Pub. Housing Auth., NHA, 1205 Electric Bldg., Seventh and Taylor Sts., Fort Worth, Tex., 220 family dwelling units, NM 29168. Tentative date. Haynes & Strange, Parkill, Voelckef & Dixon & Schaefer, 702 Main St., Lubbock, Tex., archts. CD 8/18—ENR 8/26.

†**New Jersey** — Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., community bldg., housing NJ 28021. Plans deposit $10. H. Irving Braun, 191 Bway., Long Branch, archt.

†**O., Dayton**—Pub. Bldgs. Admin., 18 and F St. N.W., Wash. 25, D. C., Miami Valley Hospital, temporary addn., Docket 33-149. **FWA**, Schenck & Williams, 1406 Third National Bank Bldg., archts. CD 12/15—ENR 12/17.

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., site imprvs., housing Pa. 36131. Plans deposit $25. Button, Sterling & McLean, 119 E. Montgomery St., Pittsburgh, archts. CD 8/5—ENR 8/12.

Bids Asked September 8

N. Y., Kings Park—Comr. Mental Hygiene, State Office Bldg., Albany, steam service tunnels, Veteran's Group, Kings Park State Hospital, Spec. 11612. $105,000. Extended date. Plans deposit $15. CD 6/18—ENR 6/24.

Bids Asked September 9

†**Michigan**—Pub. Housing Auth., 2073 E.

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

Ninth St., Cleveland, O., temporary family dwelling units. Mi. 26180. Plans deposit $50. Winn & P. Brezner, Highland Park, archts. CD 8/12—ENR 8/19.

Bids Asked September 10

†**Ariz., Douglas**—Pub. Housing Auth., NHA 785 Market St., San Francisco, Calif., 60 family dwelling units, Ariz., 2328. Tentative date. Place & Place, 20 E. Pennington Ave., Tucson, archt. CD 8/12—ENR 8/19.

Bids Asked September 11

†**Ohio**—Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, temporary family dwelling units, Ohio 23266. Plans deposit $50. Triangle Associates, 4614 Prospect Ave., Cleveland, archts. CD 8/10—ENR 8/12.

†**Wash., Forks**—Pub. Housing Auth., NHA, Skinner Bldg., Fifth Ave. and Union St., Seattle, Zone 1, 20 family dwelling units, Wash 45294 Tentative date. Stuart, Kirk & Durham, 4 and Cherry Bldg., Seattle, archts. CD 8/19—ENR 8/26.

†**Wash., Longview**—Pub. Housing Auth., NHA, Skinner Bldg., Fifth Ave. and Union St., Seattle, Zone 1, 100 family dwelling units, Wash., 45235. Tentative date. D. J. Stewart, 232 Central Bldg., Vancouver, archt. CD 8/19—ENR 8/26.

Bids Asked September 12

†**Nev., Reno**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., 60 dormitory units, Nev. 26155. Tentative date. De Longchamps & O'Brien, Phelan Bldg., San Francisco, Calif., archts. CD 8/10—ENR 8/12.

Bids Asked September 13

†**Calif., Vallejo**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 1000 family dwelling units, Calif. 4731. Tentative date. Bangs, Narbett & Spencer, 468 31 St., Richmond, archts CD 6/24—ENR 7/1.

†**Colo., Cowdrey**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 15 family dwelling units, Colo. 5107. Tentative date. T. H. Buell, 1/ and Stout Sts., Denver, archt. CD 8/2—ENR 8/5.

†**Colo., Kokomo**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 15 family dwelling units, Colo 5104. Tentative date. T. H. Buell, 14 and Stout Sts., Denver, archt. CD 8/2—ENR 8/5

†**New Jersey**—Pub. Housing Auth., NHA, 270 Bway, New York, 7, N. Y., 200 family dwelling units, NJ 28162. Tentative date. Plans deposit $50. Williams & Churchill, 56 W. 45 St., New York, N. Y., archts CD 8/12—ENR 8/19

†**Utah, Salt Lake City**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash. 25, D. C., detention hospital, Utah 42-146. **FWA.** C. Scott, Dooly Bldg., archt. CD 6/30—ENR 7/8.

†**Wyo., Superior**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 30 family dwelling units, Wyo. 48083. Tentative date. Five Associates, Belvedere Hotel, Salt Lake City, Utah, archt. CD 8/2—ENR 8/12.

Bids Asked About September 13

†**Ala., Huntsville**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., schools, Units A and B. Docket Ala. 1-213. **FWA.** C. C. Pearson, 115 S. Union St., Montgomery, archt. CD 8/17—ENR 8/19.

Bids Asked September 14

†**Arizona**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., family dwelling units, Ariz. 2326 and dormitory accommodations, Ariz. 2327. Lescher & Mahoney, Title & Trust Bldg., Phoenix, archts. CD 8/19—ENR 8/26.

†**Ia., Knoxville**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash, D. C., hospital bldgs., utilities, 350,000. Extended date. CD 8/26—ENR 8/26.

†**Mississippi**—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., bldg., incl. outside utilities, Harrison Co.

†**Mississippi**—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., bldgs., incl. outside utilities, paving, Madison Co.

Bids Asked About September 15

†**O., Sidney**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash. 25, D. C., hospital addn., Ohio 33-248, **FWA.** F. E. Freytag, Sidney, archt. CD 8/19—ENR 8/26.

†**Fla., Key West**—Federal Works Agency, 18 and F Sts. N.W., Wash. 25, D. C., hospital addn., Fla. 8-906. J. Allen Long, Key West, archt. CD 4/8—ENR 4/15.

Bids Asked

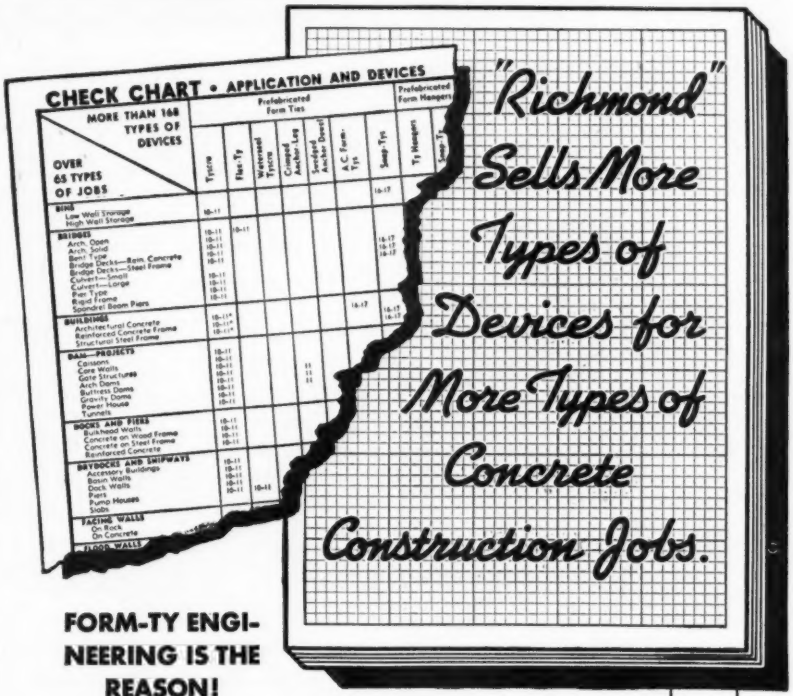
†**California**—U. S. Eng., 1209-8 St., Sacramento, Zone 8, bldg., No. 653, San Joaquin Co.

†**Maine**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., 1 story community bldg., housing NH 27011, incl. site imprvs., grading, utilities, etc. Plans deposit $50 first set, $10 ea. addnl. set. T. F. McDonough, 168 Dartmouth St., Boston, Mass., archt.

†**Massachusetts**—U. S. Eng., 31 St. James Ave., Boston, (selected bidders), bldg. alterations, No. 19-023-44-Neg-31. Under $50,-000.

†**Massachusetts**—U. S. Eng., 31 St. James Ave., Boston, (selected bidders) interior bldg. alterations, No. 19-023-44-Neg-30. Under $50,-000.

FORM-TY ENGINEERING FACTS



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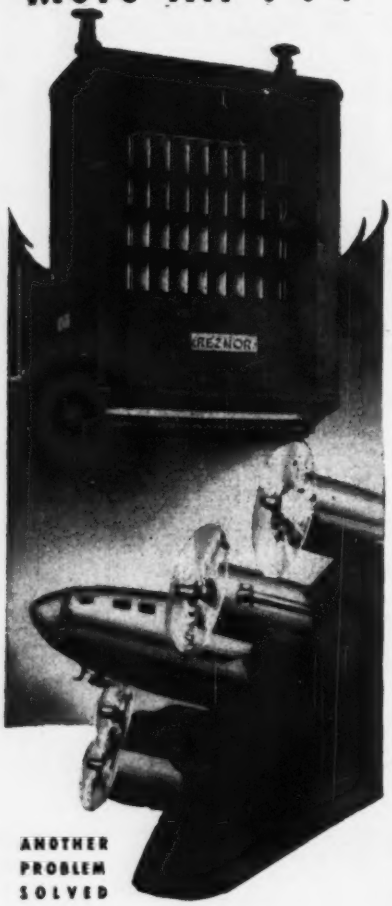

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

†**Mississippi**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 100 family dwelling units, Miss. 22174. I. Daniel Gehr & J. Allen Bradford, Old Peoples Band Bldg., Biloxi, archts. CD 8/16—ENR 8/19.

†**New Hampshire**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., 1 story, 20x46 ft. community bldg., NH 27021. Plans deposit $50 first set, $10 ea. addnl. set. A. T. Granger, Hanover, archt., Hayden, Harding & Buchanan, Park Sq. Bldg., Boston, Mass., engrs.

†**New Jersey**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., 120 family dwelling units, NJ 5-3. Nicklewright & Mountford, 219 E. Hanover St., Trenton, archts. CD 6/22—ENR 7/24.

†**New York**—Pub. Housing Auth., NHA, 270 Bway., New York, Zone 7, addn. to community and store bldg., NY 30082. Extended date. Plans deposit $25. Mayer & Whittlesey, 31 Union Sq., New York, archts. CD 8/5—ENR 8/12.

†**Texas**—U. S. Eng., Fort Sam Houston, addns. between bldgs., facilities, etc., Bexar Co.

†**Texas**—U. S. Eng., Fort Sam Houston, bldg., facilities, utilities, etc., Bexar Co.

LOW BIDDERS

†**Alabama**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., dwelling units, Ala. 1208, from A. Berney Jones, 409 Monroe St., Montgomery, Ala., Schedules **(1) $183,000, (2) $182,500.** CD 8/11.

†**Ala., Tuskegee**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., D. C., Aug. 17, infirmary bldg., from Tremaglio Bros., Box 910, Waterbury, Conn., **$347,000.** CD 7/21—ENR 7/23.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, addnl. bldgs., Lamar Co., from H. Dyer, Dallas Gas Bldg., Dallas, under **$200,000.**

CONTRACTS AWARDED

†**Alabama**—Rheem Mfg. Co., 2901 35 Ave. N., Birmingham, plant addn., remodeling, to Christie, Hutchinson & Burton Co., 113 3 Ave. N., Birmingham; electrical work, to Dyer Electric Co., 905 S. 22 St., Birmingham. Est. **$40,000.** Defense Plant Corp will finance. CD 6/9—ENR 6/17.

★**Alta., Edmonton**—Wartime Housing, Ltd., 55 York St., Toronto, Ont., 250 houses, to Bennett & White, 6 James Richardson Bldg., **$987,000.**

★†**California**—City of Alameda Housing Auth., 511 Buena Vista Ave., Alameda, family dwelling units, community and 2 child service bldgs., Calif. 4721, for NHA, to Stolte, Inc., 1405 San Antonio Ave., Alameda, **$2,510,000.** CD 8/17—ENR 8/19.

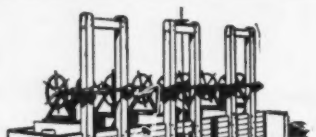
†**California**—Consolidated Vultee Aircraft Corp., Pacific Ave., San Diego, 1 story 72x150 ft., rein.-con., steel factory addn., to Austin Co., 777 E. Washington Blvd., Los Angeles, approx. **$53,000.** Federally financed.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, dwelling units, Spec. 1056, San Francisco Co., to DeLuca & Son, 1745 Filbert St., San Francisco. CD 8/3—ENR 8/5.

†**Calif., San Diego**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., maintenance and repair facilities, Camp Elliott, NOY 6550, to Baruch Corp., 625 S. Olive St., Los Angeles, **$54,135.**

†**Colo., Glenwood Springs**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., altering bldg. to convalescent hospital, NOY 6285, to Mead & Mount Constr. Co., Denver National Bank Bldg., Denver. **$291,163.**

★†**Conn., Bridgeport**—St. Vincent's Hospital, 2820 Main St., hospital wing, nursing school, pediatric bldg., Conn. 6-134, Hawley



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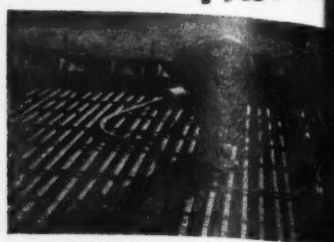

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PUBLIC BUILDINGS (Contracts Awarded, Cont'd.)

Ave., Mais, Gurdon and Hunting Sts., to Edward E. Bray Co., Inc., 362 River St., $115,357. FWA. Bids 8/10. CD 8/13—ENR 8/19.

†Florida—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, bldg., Neg-Jax-44-114, Dade Co., to Fred Howland, Inc., 1114 Postal Bldg., Miami, Zone 6. Est. under $500,000. Awarded 8/13.

†Florida—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, bldgs., Neg-Jax-44-93, Duval Co., to R. A. Bowen Constr. Co., Macon, Ga., under $50,000. Awarded 8/13.

†Florida—U. S. Eng., 575 Rivrside Ave., Jacksonville, Zone 2, bldgs., Neg-Jax-44-117, Dade Co., to Deegaard & Preston, Coral Gables, under $50,000. Awarded 8/18.

†Florida—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, bldgs., Neg-Jax-44-108, Charlotte Co., to R. E. Clarson, Inc., 101 5 St. S. St. Petersburg, under $100,000. Awarded 8/13.

★†Idaho, Farragut—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D.C., housing, N. T. S., NOY 6690 to Pound Kiewit Constr. Co., Northern Life Tower Bldg., Seattle, Wash., $616,694.

†Illinois—U. S. Eng., 520 Merchandise Mart, Chicago, bldgs., Fulton Co., to Paul Steenberg Co., Macomb, $60,000.

†Massachusetts—U. S. Eng., 31 St. James Ave., Boston, temporary bldg., No. 19023-44-Neg-23, Suffolk Co., to Frankini Constr., Co., 20 Mystic Ave., Medford. Est. under $50,000.

†Michigan—Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, O., housing, Mich. 20190 to James McHugh, 6449 South Park Ave., Chicago, Ill., $405,000. CD 8/5—ENR 8/12.

★†Michigan — Pub. Housing Auth., NHA, 2073 E. Ninth St., Cleveland, O., family dwellings, Mich-20190, to James McHugh, 6449 South Park Ave., Chicago, Ill., $550,006. Bids 8/2. CD 7/21.

†Mississippi—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., dental clinic, incl. outside facilities, Inv. No. 569-44-33, Grenada Co., to F. T. Newton, Hattiesburg, under $50,000. Awarded 8/17.

†Mississippi — Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., housing, Miss. 22171, 22165, 22175 and 22173, to Algernon Blair, Inc., First National Bank Bldg., Montgomery, Ala., $400,161. CD 7/28—ENR 8/5.

★†Nebraska—U. S. Eng., 1709 Jackson St., Omaha, bldgs., Sarpy Co., to Standard Constr. Co., Inc., 604 National Bldg., Minneapolis, Minn. Est. approx. $1,000,000.

†New Jersey—N. J. Shipbuilding Corp., 1200 State St., 1 story, frame cafeteria and locker bldg., to Wallace Witck, 280 Hobart St.; electrical work, to Bachman Electric Co., 218 Smith St. Est. over $40,000. Federally financed. CD 8/9—ENR 8/12.

†N. J., Wildwood—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., magazine, Naval Air Station, NOY 6475, to O. Hanson, 7215 Atlantic Ave., Ventnor City, $53,687.

†N. C., Edenton—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., facilities for officers and enlisted personnel, M. C. A. S., NOY 6624, to V. P. Loftis, Inc., Builders Bldg., Charlotte, $210,631. CD 8/1.

†Ohio—Rubber Reserve Co., 1452 E. Archwood Ave., Akron, 1 story, 75x120 ft., brick, concrete machine shop and laboratory to Indiana Engr. & Constr. Co., 109 N. Union St., Akron. Est. $40,000. Federally financed. H. Gordon Turnbull, Inc., 2530 Chester Ave. Cleveland, engrs.

†Okla., Clinton—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., synthetic trainer bldg., Naval Air facility, NOY 6503, to Ditmars-Dickman Constr. Co., 304 Barns Bldg., Muskogee, $74,900.

†Okla., Muskogee—R. Tucker, city mgr., City Hall, City-County hospital bldg., Okla. 34-166, to Manhattan Constr. Co., Muskogee, approx. $157,000. FWA. Bids 8/11. CD 8/5.

†Oregon—Pub. Housing Auth., NHA, Skinner Bldg., Seattle 1, Wash., dwelling units, facilities, Ore. 35266, from Beckett, Bridges & Welcer, Bd. Trade Bldg., Portland, $189,753, alt. $199,753. Marion & Allyn, Hughes Bldg., Portland, archts. CD 7/20—ENR 7/22.

★†Pennsylvania—Pub. Housing Auth., NHA, 270 Bway., New York 7, N. Y., Aug. 16, family dwelling units, Pa. 36436, from Rathbeb-Walsh Co., 184 N. Main St., Portchester, N. Y., Schedules (A) $906,888, (B) $916,888. CD 8/5—ENR 8/12.

†Pennsylvania—U. S. Eng., Transfer, bldgs., Mercer Co., to Associated Contractors, Inc., Greenville, Est. $150,000. Bids 8/4, Gannett, Eastman & Fleming, Transfer, archts.

†Rhode Island—U. S. Eng., 819 Industrial Trust Bldg., Providence, station, facilities, No. 43-250, Newport Co., to City Lumber Co., 76 Third St., Bridgeport, Conn.; electrical work, to Coken Co., 16 Greene St., Providence. CD 6/16.

†Rhode Island—U. S. Eng., 819 Industrial Trust Bldg., Providence, garage depot, No. 44-14, Providence Co., to E. Turgeon, 614 Turks Head Bldg., Providence. Est. under $50,000. Bids 8/18.

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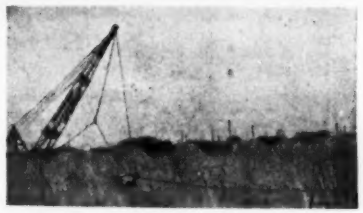

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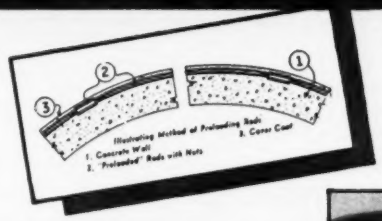

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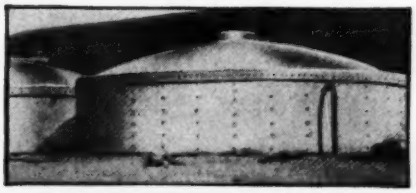

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PUBLIC BLDGS. (Contracts Awarded, Cont'd)

†**R. I., Charlestown, Westerly and Martha's Vineyard**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., magazine and machine gun ranges, NOY 6469, to E. Turgeon, 614 Turks Head Bldg., Providence, **$157,100.**

★†**S. C., Parris Island**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., facilities for Marine Corps Women's Reserve, Marine Barracks, NOY 6317, to Central Contracting Co., 513 First National Bank Bldg., Atlanta, Ga., **$524,893.**

†**Texas**—U. S. Eng., Fort Sam Houston, electrical work for bldg., Spec. 915, Bexar Co., to Thomson Electric Co., 1615 Bway., San Antonio. CD 8/17—ENR 8/19 under LB.

†**Texas**—U. S. Eng., Fort Sam Houston, bldg., facilities, utilities, etc., Bexar Co., to H. Bumbaugh & Co., 102 Grandview St., San Antonio, approx. **$25,000.**

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, trainer bldg., facilities, Cameron Co., to Noser Constr. Co., McAllen, approx. **$25,000.**

†**Wisconsin**—Defense Plant Corp., 811 Vermont Ave., N.W., Wash., D. C., 1 story, 175x200 ft., brick, rein.-con. engine test bldg., to Gust K. Newberg Constr. Co., 9 S. Clinton St., Chicago, Ill. Nash-Kelvinator Corp., 5625 25 Ave., Kenosha, will operate. Giffels & Vallet, 1000 Marquette Bldg., Detroit, Mich., archt.

Que., Granby—Rev. Sisters Grises (de St. Hyacinthe), St. Hyacinthe, 4 story, bsmnt., 50x160 ft., T shaped, rein.-con., cut stone, brick hospital, to A. Deschamps, 680 Sherbrooke St. W., Montreal, about **$250,000,** Perrault & Gadbois, 3795 Van Horne Ave., Montreal, archts. CD 4/12—ENR 4/15.

COMMERCIAL BUILDINGS

PROPOSED WORK

Conn., New London—Lawrence & Memorial Assoc., Hospital, Montauk, New London, sketches by F. S. Langdon, 240 State St., 2 story, brick nurses training school, $150,000.

N. J., Nutley—W. E. Lehman, Inc., 972 Broad St., Newark, 2½ story, brick veneer colonial type L-shaped garden apartment. $150,000.

Tex., Beeville—Rentals, Inc., Beeville, 50 frame dwellings, utilities $210,000.

Tex., Dallas—Airway Constr. Co., Wanebe and Denton Dr., $150,000, approx. 25 dwellings or duplexes.

Tex., Houston—Hermann Hospital, Hermann Park Dr., plans by H. Lloyd, 2006 W. Alabama St., dormitory bldg., facilities, etc. $150,000.

BIDS ASKED

★**Tex., Goose Creek**—Hedrick & Lindsley, archts., 811 Southern Standard Bldg., Houston, 150 dwellings, utilities, streets, etc., Morrell Park addn., for Texjas Development Co., Goose Creek, $500,000. Extended date. CD 8/13—ENR 8/19.

CONTRACTS AWARDED

★**California**—Imperial Homes, Inc., 107 N. Larchmont Blvd., Los Angeles, 100 dwellings in Hawthorne; 50 dwellings in Santa Monica, frame, stucco, to M. J. Brock & Son, Inc., 107 N. Larchmont Blvd., Los Angeles, **$700,000.**

Calif., San Bruno—Bay Counties Homes Co., Millbrae, 41 residences, El Crystal Subdivision, west of El Camino Real, etc., to A. K. Schultz, No. 1 Hillcrest Blvd., Millbrae, electrical contract, to Burlingame Electric Co., 109 La Cruz St., Millbrae Est. over **$150,000.**

Calif., Vacaville—Bay Counties Homes Co., Millbrae, 50 one-story frame residences, to Alvin K. Schultz, No. 1 Hillcrest Blvd., Millbrae. Est. **$200,000.** FHA.

Conn., Stamford—Owner, c/o David Mansell, assoc. archt., 24 Park Row, Stamford, and Kelley & Gruzzen, archts., Bergen Ave., Jersey City, N. J., 2½ story, brick garden

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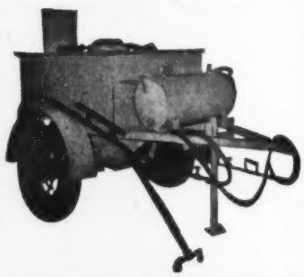

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COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

...pts., 6 St. **$150,000.** Owner builds.

La., New Orleans—Carrollton Gardens, Inc., New Orleans, 62 fourplex apartments containing 248 units, vicinity of Palm, Stoelitz Sts., ...ic., Carrollton Sect., to Crawford Co., 206 S. 14 St., Baton Rouge, Diboll-Kessels & Assoc., Inc., Baronne Bldg., archts.

Me., Portland—Victory Development Co., 37 Casco St., 248 units apartment bldgs., Baxter Blvd., to H. P. Cummings Constr. Co., Winthrop, **$1,150,000.** W. O. Armitage, 23 Mitchell Rd., S. Portland, archt. CD 5/6—ENR 5/13, under CA.

★ **Md., Turners Station**—Carver Manor, 1231 Munsey Bldg., Baltimore, 200 two-family row type residences. Owner builds. **$800,000.**

N. J., Roselle — Warinanco Village, St. George Ave., 2 story, bsmnt., brick garden apartment bldg., separate contracts; electrical work, to Globe Elec. & Maintenance Co., 249 E. 11 St., New York City, N. Y. I. Naftali, 200 Bergen Ave., Jersey City, archt. Est. $250,000. CD 7/20—ENR 7/22.

O., Cleveland—Colony Investment Co., c/o Chas. Bernstein & Assoc., Hippodrome Bldg., eight 2 story, bsmnt., 87x137 ft., apartment bldgs., separate contracts; masonry, to L. Zuckerman, 1836 Euclid Ave.; carpentry, to Epstein Constr. Co., 765 Lakeview Rd. Est. $250,000. G. H. Burrows, 3113 Moreland Blvd., archts.

O., Euclid—Wm. West & Son, 1509 Sherbrook Rd., South Euclid, sixty 1 story, bsmnt., 25x29 ft., brick dwellings. Owner builds, **$360,000.**

Tex., Abilene—Country Club Homes, Inc., Abilene, 40 frame dwellings, force account. Approx. **$150,000.** CD 8/13—ENR 8/19.

Tex., Dallas—Airways Constr. Co., Construction Bldg., Dallas, twenty-one, 1 story, brick veneer duplex dwellings, utilities, force account. Approx. **$160,000.** CD 8/12—ENR 8/19.

Tex., Dallas—Carver Courts, Inc., 1215 Main St., 51 frame dwelling units, concrete fdns., to Sam Lett, 5644 Carruth St., Dallas, approx. $190,000. H. S. Avery, 2717 Kendale St., archt. CD 8/11—ENR 8/19.

Tex., Dallas (at Oak Cliff)—Gardens Development Co., Neely St., twenty-six 6 room, brick veneer dwellings, utilities, facilities, etc., force account. Approx. **$150,000.** CD 8/16—ENR 8/19.

Tex., Dallas—Garland Homes, 3418 Normandy St., 22 or more 1 story, frame, asbestos type dwellings, facilities, utilities, to Jno. R. McFadden, 3418 Normandy St., approx. **$150,000.** CD 8/11—ENR 8/19.

Tex., Goose Creek—Bay Builders, Inc., 2319 McClendon St., Houston, 25 dwellings, force account. Approx. **$150,000.** CD 8/9—ENR 8/12.

Tex., Houston—Interstate Circuit, Inc., Melba Theatre Bldg., repairing and new units for 5 principal theatres (due to recent hurricane), to G. P. O'Rourke Constr. Co., P. O. Box 7557, Zone 7, approx. **$200,000.**

★ **Tex., Texas City**—Snug Harbor Homes, c/o M. A. Silverman, 2816 Plumb St., Houston, plans by Herman Lloyd, 4605 Montrose Blvd., Houston, 456 frame and asbestos siding homes, concrete pier fdns., day labor, $2,052,000. CD 7/2—ENR 7/8.

INDUSTRIAL BUILDINGS

PROPOSED WORK

La., Gretna—PLANT—Gulf Distilling Corp., Gretna, soon lets contract, yeast house. J. B. Moses & L. S. Weil, 427 S. Peters St., New Orleans, engrs.

Miss., Meridian—MILL—C. W. Parham Lbr. Co., Farnsworth Bldg., Memphis, Tenn., rebuilding bandmill, destroyed by fire. $50,000 incl. equip.

Nev., Sparks—LOCOMOTIVE SHOP—Southern Pacific Co., W. H. Kirkbride, ch. engr., 65 Market St., San Francisco, Calif., soon lets contract, locomotive erecting shop.

Tex., Houston—PLANT—Oil Tool Mfg. Co., 918 Mance St., plans by S. Dixon, 6902 Main St., structural steel, and masonry plant unit. $75,000.

Tex., Mexia—PLANT—Munger Cotton Oil Co., Mexia, reconstructing storage and plant facilities for cotton mill and gin. $40,000.

BIDS ASKED

Bids Asked September 1

Ont., Fire River—PLANT—Canadian Natl. Railways Co., R. Wheelwright, ch. engr., Union Station, Toronto, 150 ton rein.-con. coaling plant structure. About $45,000.

Bids Asked

Conn., West Haven—FACTORY—Armstrong Rubber Co., 475 Elm St., 1 story, 100x160 ft., rein.-con. factory addn. Over $40,000. Fletcher, Thompson, Inc., 211 State St., Bridgeport, engr.

Massachusetts—SHOP—Bethlehem Hingham Shipyd., Inc., East Howard St., Quincy, pipe mill shop, brick. $40,000.

N. J., Elizabeth—Central R. R. of New Jersey, A. E. Owen, ch. engr., Reading Terminal, Phila., Pa., 2 story, brick, steel locomotive repair shop, $45,000.

Utah, Provo — PLANT — Denver & Rio Grande Western R. R. Co., A. E. Perlman, ch. engr., Rio Grande Bldg., Denver, Colo. (selected list bidders), brick car dpt. bldg., concrete fdn.

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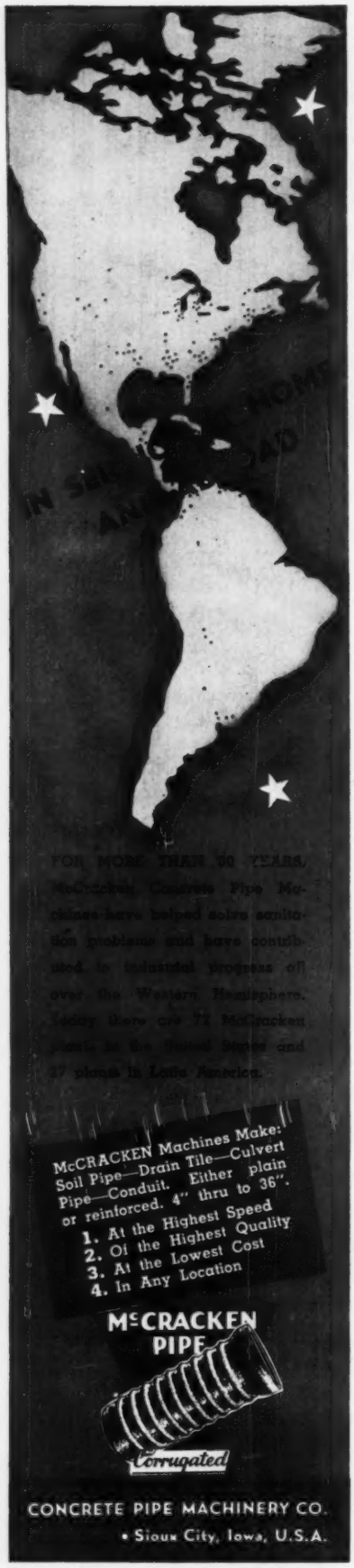
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INDUSTRIAL BLDGS. (Contracts Awarded, Cont'd.)

★**Alabama** — DETINNING PLANT — Johnston & Jennings Co., 877 Addison St., Cleveland, O., detinning plant, to The H. K. Ferguson Co., Hanna Bldg., Cleveland, O., electrical work, to Broadway Elec. Constr. Co., Atlanta, Ga. Est. **$2,000,000.**

Calif., San Pedro—MACHINE SHOP—Western Pipe & Steel Co., 1660 Wilmington—San Pedro Rd., machine shop bldg. addns., alterations, to N. M. Calhoun, 845 N. Highland Ave., Los Angeles, approx. **$50,000.** Taylor & Taylor, 803 W. 3 St., Los Angeles, engrs.-archts.

Calif., Santa Monica—PUNCH PRESS SHOP, etc.—Douglas Aircraft Co., 3000 Ocean Park Blvd., 1 story, frame punch press and template shop, to J. O. Oltmans & Son, 810 E. 18 St., Los Angeles, approx. **$40,000.**

Conn., Naugatuck — PLANT BLDGS. — Naugatuck Chemical Div. Naugatuck Rubber Co., Elm St. (selected bidders), brick, plant addns., warehouse addn., administration bldg., and garage bldg. Fletcher Thompson, Inc., 211 State St., Bridgeport, engrs.

Ind., Lapel—PLANT—Sterling Glass Co., Lapel, 1 story, 86x260 ft. brick, concrete plant, to Carl M. Geupel Constr. Co., 923 Hume Mansur Bldg., Indianapolis. **$50,000,** cost plus percentage basis. Awarded 8/14, Erwin F. Miller, Forest Hills, Anderson, archt.

Mass., Springfield — PLANT — Monsanto Chemical Co., 600 Main St., Indian Orchard, 2 and 4 story, 40x100 ft. and 25x95 ft., respectively, resinox unit addns. to J. G. Roy & Sons Co., 21 Silver St., Springfield. Est. **$55,000.**

N. J., Harrison—GENERATOR HOUSE—Public Service Gas & Electric Co., 80 Park Pl., Newark, 2 story, 62x96 ft., brick generator house addn., to United Engrs. & Constructors, Inc., 140 Arch St., Phila., Pa., **$140,000.**

N. J., Trenton—FACTORY—Westinghouse Electric Co., Maloney Bldg., Blvd. of Allies Blvd., Pittsburgh, Pa., maintenance factory bldg., to W. C. Ehret, 209 Academy St., Trenton, **$45,000,** H. L. Heilman, Maloney Bldg., Blvd. of Allies, Pittsburgh, Pa., archt.

N. Y., Jamestown—TRUCK TERMINAL, etc.—Lyons Transportation Co., 60 River St., R. S. Olofson, genl. mgr., motor freight truck terminal and office bldg., 25x94 ft. main bldg., with 25x50 ft. ells, Winsor St., to Warren Constr. Co., 335 Steele St. Est. **$40,000,** incl. equip.

Tex., Baytown—PLANT—Humble Oil & Refining Co., repairing, imprv. new Toluol plant, damaged by hurricane, force account. **$100,000.** CD 8/5—ENR 8/12.

Tex., Houston — PLANT — Harris County Farmers Victory Co-Operative Society, 1918 Gray St., expansion vegetable processing and canning plant. Purchase and hire method. Over **$40,000.**

Tex., Houston—PLANT—McEvoy Co., 600 Milby St., Houston, plant bldg. shop, to P. M. Marshall, 2216 Congress St., approx., **$53,000.**

Tex., Texas City—OIL PUMPING STATIONS—Gulf Oil Co., Gulf Bldg., Houston, imprv. 5 oil pump. stations; purchase and hire method, approx. **$75,000.** CD 8/5—ENR 8/12.

Wis., Ladysmith — CREAMERY — Ladysmith Milk Producers Assn., Ladysmith, electrical contract for 1 story, 56x102x186 ft., brick creamery addn., to Uihlein Elec. Co., 514 E. Ogden Ave., Milwaukee, Zone 2. CD 7/27—ENR 7/29, under CA.

Wis., Menasha — PLANT — Wisconsin Rendering Co., R. 1, Appleton, rebuilding 1 and 2 story, 80x125 ft. rendering plant, brick, tile, concrete, to Fluor Bros. Constr. Co., 48 Otter St., Oskosh.

Wis., Bayfield—PLANT, etc.—Otto L. Kuehn Co., 403 E. Detroit St., Milwaukee, 1 story, 48x52 ft. fish plant addn., 1 story, 9x19 ft. boiler room, both rein.-con., brick, 16x160 ft. wood and piling wharf, to A. H. Proksch, Iron River. CD 7/14—ENR 7/22.

Proposal Advertisements see p. 145-146
Postwar Projects see p. 116

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Queensboro Structural Steel Co.
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Stapf, John
Stevens-Alquist, Inc.
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OFFICIAL PROPOSALS

RATE: THE RATE FOR OFFICIAL PROPOSAL ADVERTISING IS 50 CENTS PER LINE (OR FRACTION) PER INSERTION
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SEND COPY TO OFFICIAL PROPOSAL DIVISION, ENGINEERING NEWS-RECORD, 330 W. 42ND ST., NEW YORK, N. Y.

Bids: September 7, 1943 (170)

Relocation of Channel

Sealed proposals will be received at the office of the Project Manager, United Engineering and Foundry Company, Acting for and on Behalf of Defense Plant Corporation, an Instrumentality of the United States Government Plancor 765, New Castle, Pennsylvania, until 1:30 P. M. (Eastern War Time), September 7, 1943, and will be publicly opened and read immediately thereafter in the presence of the bidders or their duly authorized representatives, for the relocation of the Channel of the Neshannock Creek, and work incident thereto, as follows:

DIVISION I	NESHANNOCK CHANNEL CHANGE
DIVISION II	SHENANGO RIVER CHANNEL WIDENING
DIVISION III	PENNSYLVANIA RAILROAD BRIDGE CONSTRUCTION
DIVISION IV	ERIE RAILROAD BRIDGE CONSTRUCTION
DIVISION V	SANITARY SEWER RELOCATION
DIVISION VI	STORM SEWER EXTENSION
DIVISION VII	YARD TRACK RELOCATION
DIVISION VIII	MAIN RAILROAD TRACK CONSTRUCTION
DIVISION IX	RAILROAD DETOUR BRIDGES AND TRACK

Copies of the Contract Drawings, specifications and blank proposals can be obtained at the office of the Project Manager, Sherman Street, New Castle, Pennsylvania, and may be seen at the offices of the United Engineering and Foundry Company, Acting for and on Behalf of the Defense Plant Corporation, Room 1807, First National Bank Building, Pittsburgh, Pennsylvania. A cash deposit of twenty dollars ($20.00) will be required for each set of plans and specifications taken from the office of the Project Manager and this will be refunded if a bid is submitted, or the plans and specifications are returned to the above office in good condition within thirty (30) days after date of receiving bids.

Each proposal must be accompanied by a certified check, in the amount of not less than five (5) percent of the total amount bid, such check to be made payable to the United Engineering and Foundry Company, Acting for and on Behalf of Defense Plant Corporation, and to be held as a guarantee that, in the event the bid is accepted and a contract awarded to the bidder, the contract will be duly executed and its performance duly secured by the required performance and liability bonds, and if in default, the said check and the amounts represented thereby will be forfeited to the United Engineering and Foundry Company, Acting for and on Behalf of Defense Plant Corporation, to be applied upon all damages sustained by the United Engineering and Foundry Company, Acting for and on Behalf of Defense Plant Corporation, by reason of said default. Each bidder is required to execute the non-collusion affidavit as included in the contract documents. If required by the Owner, the Contractor shall furnish performance and payment bonds in form and amount satisfactory to the Owner, in a sum not less than one hundred (100) percent of the total price bid for the completed work, said bond to be that of an approved surety company or approved surety companies authorized to transact business within the State of Pennsylvania. The said surety bond shall be in the full amount of the contract and shall be conditioned for the payment of labor and materials and for the complete performance of the terms of the contract and including twelve (12) months guarantee.

Each proposal must be made upon the blanks furnished with the contract drawings and specifications, and it must be delivered at the office of the Project Manager, New Castle, Pennsylvania, previous to the time above stipulated.

No bidder may withdraw his bid for a period of thirty (30) days after the opening of bids.

The United Engineering and Foundry Company, Acting for and on Behalf of Defense Plant Corporation, reserves the right to reject any or all bids, to waive any informalities in the bids received, and to accept any bid which is deemed most favorable.

Wm. R. Hodder,
Project Manager.

Bids: Sept. 14, 1943 (167)

Pumps and Piping
South District Filtration Plant

DEPARTMENT OF PUBLIC WORKS
CITY OF CHICAGO
CHICAGO, August 17, 1943.

SEALED PROPOSALS will be received by the City of Chicago until 11 A. M. (Central War Time), on Tuesday, September 14, 1943, at Room 406, City Hall, at which time and place all such proposals will be publicly opened and read, for furnishing, delivering and installing Pumps and Piping, including Traveling Crane, for the South District Filtration Plant, located in the vicinity of East 79th Street and Lake Michigan, Chicago, Illinois, in accordance with plans and specifications on file in the office of the Department of Public Works of said City, Room 406, City Hall.

The work to be done includes furnishing and delivering:

Division A—Two 700 gpm. horizontal centrifugal pumps.
Division B—One 7,500 gpm. vertical centrifugal pump.
Division C—Three 850 gpm. horizontal centrifugal sludge pumps.

It also includes furnishing, delivering and installing:

Division E—One 3-motor, 15-ton traveling crane.
Division F—Piping and miscellaneous equipment.

Under Division F the installation of the equipment in Divisions A, B and C is included, together with the installation of eight low lift pumps and motors previously purchased by the City.

Proposals must be made out upon blanks furnished at said office of the Department of Public Works, and be addressed to said Department, indorsed "Proposal for Pumps and Piping, South District Filtration Plant," and be accompanied with the following sums in money, or certified checks in the same amounts on responsible banks located and doing business in the City of Chicago and made payable to the order of the Commissioner of Public Works:

Divisions A, B and C....each	$100.00
Division E	$1,000.00
Division F	$5,000.00

Plans and specifications may be obtained upon payment of Fifteen Dollars ($15.00) for each set, which will be refunded upon the return of said plans and specifications in good condition within thirty (30) days after the opening of bids. Deposits to be in the form of money or certified check.

In accordance with the provisions of the Act of the General Assembly of the State of Illinois, entitled "An Act regulating wages of laborers, mechanics and other workmen employed under contracts for public works," approved June 26, 1941, the general prevailing wage rates for work at the construction site are set forth in the specifications.

The Commissioner of Public Works reserves the right to reject any or all bids.

No proposal will be considered unless the party submitting the same shall furnish evidence satisfactory to the Commissioner of Public Works of ability, and the possession of the necessary facilities, together with sufficient pecuniary resources, to fulfill the conditions of the contract and specifications.

OSCAR E. HEWITT,
Commissioner of Public Works.

Bids: September 10, 1943 (169)

Sewer Construction

Sealed proposals for constructing approximately 130 feet of 6-inch, 7,950 feet of 8-inch, 460 feet of 10-inch, 510 feet of 12-inch, 1,770 feet of 15-inch vitrified pipe sewers and 1,570 feet of 6-inch vitrified pipe sewer house connections on Contract 147-S will be received at the office of the Washington Suburban Sanitary Commission, Hamilton Street, Hyattsville, Maryland, until 3:00 P. M., Friday, September 10, 1943, at which place and time they will be publicly opened and read.

Plans and specifications may be obtained from Harry R. Hall, Chief Engineer of the Commission, Hyattsville, Maryland, upon deposit of $5.00, which deposit will be returned to bidders, or to those returning plans and specifications in good condition.

WASHINGTON SUBURBAN SANITARY COMMISSION
Perry Boswell
J. Donald Clagett
Frank B. Smith
Commissioners.

Bids: Sept. 2, 1943 (168)

State Highway Work

STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
Albany, N. Y.

Proposals will be received by the State Department of Public Works, Division of Highways, Albany, N. Y., on Thursday, ***September 2, 1943***, until one o'clock P. M., Eastern War Time, for the construction of the following highways:

County	Deposit for plans	Bid deposit	Type	Miles	Priority rating
Nassau	$5	$2,500	30' Unreinf. Conc. Misc. Work & Bit. Treat.....	1.21	---
Niagara	5	1,100	24' Unreinf. Conc. Misc. Work.....	0.31	---
Rockland	5	4,000	20' Cinder Surfacing 20' and Var. MM. 3 Conc. T-Beam Br. 34' span Timber Trestle, four 15'-10" Spans	1.07	.....
Suffolk	5	7,000	20' R. C. Pavt. 8" Misc. Work.....	2.32	Ser. 93083E AA. 3-AA. 5

Maps, plans, specifications, and estimates may be obtained at the office of the Division of Highways, Albany, N. Y., and at the office of the District Engineers in whose districts the roads are located. The addresses of the District Engineers and Counties will be furnished upon request. Plans and proposal forms may be seen at the office of the State Department of Public Works, State Office Building, Worth and Center Streets, New York City.

The deposit for Plans and Proposal Forms for each contract containing 1 to 15 sheets is $5.00; 16 to 30 sheets, $10.00; over 30 sheets, $20.00. A refund will be made in full to bidders for return of one set, in good condition, within 30 days of award, or rejection of bids; refund for all other sets in good condition, similar period, will be 50% of deposits.

Special attention of bidders is called to "General Information for Bidders" in the proposal, specifications, and contract agreement, and to the special provisions applying to projects financed with federal funds.

Proposal for each contract must be submitted in a separate sealed envelope with the name and number of the contract plainly endorsed on the outside of the envelope. Each proposal must be accompanied by cash, draft or certified check payable to the order of "State of New York, Division of the Treasury," for the sum as specified in the advertisement and the proposal. The retention and disposal of the bidding check, the execution of the contract and bonds shall conform to the provisions of the Highway Law, as set forth in "Instructions to Bidders."

When optional types are permitted on contracts with federal funds, bidders must state in the space provided in the proposal the exact designation of the optional type upon which the proposal is predicated.

Minimum Wage Rate per hour for above work shall be as follows:

County	Skilled Labor	Intermediate Grade Labor	Unskilled Labor
Nassau	$.75	$.75	$.75
Niagara	.85	.85	.85
Rockland	1.00	1.00	1.00
Suffolk	.87½	.87½	.87½

Unless shown otherwise in the itemized proposal for each project.

The right is reserved to reject any or all bids.

CHAS. H. SELLS
SUPT. OF PUBLIC WORKS

Additional Proposal Advertising
Continued on page 146

THE MOST FOR THE MONEY — SPEED - EFFICIENCY - ECONOMY

CONSTRUCTION BY CONTRACT

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OFFICIAL PROPOSALS

Bids: Sept. 8, 1943 (166)

STATE OF NEW JERSEY
BOARD OF COMMERCE AND
NAVIGATION
STATE HOUSE
TRENTON, 7, N. J.
PROJECT NOS. 190-191 AUGUST 20, 1943

Sealed proposals for: Project 190, The construction of a Coast Protection Stone Jetty, on Delaware Bay, Borough of Cape May Point, Cape May County, N. J., and Project 191, construction of a Coast Protection Timber Bulkhead, Timber Pile Crib, and Stone Toe Wall, along the Atlantic Ocean Shorefront, City of Long Branch, Monmouth County, N. J., will be received at the office of the Board of Commerce and Navigation State House, Trenton, New Jersey, at 11:30 A. M. Eastern War Time, Wednesday, September 8, 1943 and then publicly opened and read aloud.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law (Title 52:35; Revised Statutes 1937) and the regulations adopted May 10, 1943 by the Board of Commerce and Navigation. Bidders must submit a revised financial statement and statement of plant and equipment with their bid.

Plans and specifications may be viewed at the office of the Board of Commerce and Navigation at 1060 Broad Street, Newark, N. J. or in the State House, Trenton, N. J., or will be furnished to contractors without charge upon request at the Newark office.

No proposal will be considered unless accompanied by a certified check made payable to the Board of Commerce and Navigation of New Jersey in amount at least five per centum (5%) of the total amount bid (Section 52:34-2, N. J. Revised Statutes), and a certied statement from a bonding company stating that it will furnish necessary performance bond. The bid deposits received with the three lowest bids may be held for thirty (30) days after the opening of bids or until forty-eight (48) hours after the accepted bidder has executed the contract and filed the required performance surety bond. All other bids deposits will be returned within three days of the opening of bids.

The accepted bidder will be required to furnish performance bond in the amount of the contract in accordance with Sections 2:60-207 to 2:60-212, inclusive, New Jersey revived Statutes, and with sureties satisfactory to the State of New Jersey.

The Board of Commerce and Navigation reserves the right to waive any informalities in or to reject any or all bids.

FRANK D. HOLMES,
Director and Secretary.

Additional
OFFICIAL PROPOSAL
Advertisements
on page 145

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